FINDING OF NO SIGNIFICANT IMPACT (FNSI) FOR BUILDING AND OPERATING A SAFE ARMAMENTS FACILITY FOR ENERGETICS RESEARCH (SAFER) AT PICATINNY ARSENAL, NEW JERSEY

Introduction

The National Environmental Policy Act of 1969 (NEPA) requires Federal Government agencies to consider potential environmental impacts prior to undertaking a course of action. Within the Department of the Army, NEPA is implemented through regulations promulgated by the Council on Environmental Quality in 40 Code of Federal Regulations (CFR) Parts 1500-1508 with supplemental requirements provided under Army Regulations 32 CFR Part 651, *Environmental Analysis of Army Actions*. In adherence with NEPA, 40 CFR 1500-1508, and 32 CFR Part 651, the U.S. Army Armament Research, Development and Engineering Center (ARDEC) prepared an Environmental Assessment (EA) to consider the environmental effects of implementing a Safe Armaments Facility for Energetics Research (SAFER).

The final EA and draft FNSI were originally released for public comment on January 11, 2012; the comment period closed on February 17, 2012. A total of 220 comments were received, focusing primarily on concerns regarding biological resources (particularly threatened and endangered species), site design, the NEPA process, and impacts to water resources.

The Army appreciates the many thoughtful, detailed comments received from interested stakeholders during the public comment period. The Army takes agency, public, and other stakeholder comments very seriously. In light of the comments received, ARDEC decided to re-visit the analysis and conclusions contained in the EA. ARDEC also conducted additional studies, including snake surveys and a hydrogeologic study, to provide a greater level of certainty for EA conclusions. Public comments and ARDEC's responses have been compiled and are included in Appendix G of the EA.

Description of Action

ARDEC leads and manages a competency-based directorate focused on energetics, warheads, and manufacturing technologies for war and peace. The Energetics, Warheads and Manufacturing Technology Directorate (EWMTD) operates and maintains prototype facilities to develop, prove out, and implement these technologies in support of ARDEC mission responsibilities of fielding armaments to the Warfighter in a timely fashion. Scientists and engineers at Picatinny Arsenal, New Jersey, integrate state-of-the-art logistics enhancements and manage explosives safety projects to develop and test "fixes" in munitions items that reduce the explosive hazards posed by those munitions items to the Warfighter.

In particular, the Army Insensitive Munitions (IM) Program and the Research and Development Army IM Improvement Program seek to adopt an inventory of the world's most lethal ground force munitions to assure they perform as intended, but are less prone to violent reaction when subjected to impact from bullets and fragments, heat from fire, and shock from neighboring explosions, thus improving safety and survivability for the Soldier in the field.

In April 2008, during open air detonation of IM, a fragment of an artillery shell traveled off the boundaries of the Picatinny Arsenal, damaging private property. Subsequently, ARDEC ceased open air detonation of IM at Picatinny Arsenal until a time when this type of detonation could be conducted in a manner that does not impact the safety of the public.

ARDEC proposes construction, operation, and maintenance of the underground SAFER at Picatinny Arsenal. The proposed SAFER would support ARDEC's mission requirements for the research and development (R&D) of IM.

Alternatives Considered in the Analysis

ARDEC used the EA to identify and evaluate alternatives for resuming IM R&D activities at Picatinny Arsenal. ARDEC concluded the Preferred Alternative is to build an underground testing facility (i.e., the SAFER) within the Gorge Test Area at the installation.

The proposed design for the SAFER chamber includes concrete floors lined with a geo-liner to eliminate the potential migration of munitions constituents or combustion byproducts from contact with groundwater below the test facility. The SAFER would also have blast doors to prevent munitions fragments from exiting the chamber.

ARDEC considered resuming open air detonation at Picatinny Arsenal; however, this alternative would not address the public safety concerns that originally led to the cessation of open air detonation, and so it has not been carried forward for analysis. ARDEC also considered several alternative locations within the Gorge to construct the SAFER. Some of the locations would have been too close to groundwater, thus making it extremely difficult to construct the facility, conduct munitions testing, and prevent the migration of munitions constituents from entering the groundwater. Those locations were eliminated from further consideration. Some of the locations also would have been too close to wetland areas on the installation. Section 2.3.2 of the EA discusses in greater detail alternative locations ARDEC eliminated from further review.

ARDEC subsequently selected one feasible location within which to construct and operate the SAFER: the 1200 Area of Gorge Test Area. This EA analyzes the potential environmental impacts from constructing and operating the SAFER at the 1200 Area and using two rock storage areas located within one quarter mile of the proposed SAFER to store excavated rock. This EA also reviews the impacts from implementing the No Action Alternative of not constructing and operating the SAFER at Picatinny Arsenal.

No Action Alternative

Under the No Action Alternative, ARDEC would not take any action to construct, operate, or maintain any facility on Picatinny Arsenal to support underground explosive or IM R&D. The R&D mission would not be supported at Picatinny Arsenal.

The No Action Alternative would require ARDEC to continue to accomplish its R&D mission at other Army installations (e.g., Aberdeen Proving Ground, Maryland, or Yuma Proving Ground, Arizona) or at offsite commercial facilities (e.g., National Technical Services Corporation, Camden, Arkansas).

This alternative would require the continued transport of experimental explosives, munitions, and other materials by truck from Picatinny Arsenal, as well as the travel of ARDEC R&D

personnel, to the designated Army or commercial locations. This transport and travel requirement would have significant impact on the R&D schedule and costs, and would significantly impact the timely development and fielding of IM to forward operating areas for Soldiers to use.

The No Action Alternative would not be a viable means for meeting ARDEC's current and future explosive and IM R&D mission requirements. ARDEC could not fully or efficiently accomplish its mission, which includes explosive and IM R&D, in support of the Department of Defense (DoD) and its Services.

The No Action Alternative also does not satisfy the screening criteria established for this project. If the No Action Alternative were implemented, ARDEC would be unable to efficiently accomplish its mission.

Preferred Alternative

The Preferred Alternative would construct, operate, and maintain an underground fragment-containing SAFER in the Gorge Test Area at Picatinny Arsenal at the 1200 Area test location.

The entrance of the proposed facility would be a pre-split face in the hillside approximately 50 feet high and 100 feet wide. Twin tunnels would be mined into the hillside, each with a nominal cross section of 15 feet to 20 feet in width and 20 feet in height. The left tunnel would rise to intersect the top of the circular chamber to allow rock bolting and scaling of a flat roof. The right tunnel would be driven level to allow blasted stone from the bottom portion of the circular chamber to be removed. The test chamber would be approximately 100 feet in diameter and 50 feet in height.

The floor of the right access entry would be on a decline toward the chamber entrance into an outside collection basin. The floor of the left access entry would be on an incline, and drainage would collect in the face-up area. The floor of the test chamber would be concrete and scored to reduce the impact from munitions detonations on the stability of the structure. A French drain design would be installed in the concrete where the flooring meets the cave walls to re-direct moisture from the walls to the collection basin downgradient of the test chamber. A geo-liner would be installed beneath the concrete floor to act as a redundant system that eliminates any potential for contaminants to migrate through cracks in the concrete to the water table.

The left-facing tunnel would serve as a ventilation shaft and, after construction, would terminate in a vertical ventilating stack. This ventilation shaft would be equipped with a filter and fan to ensure against fragments leaving the facility and to minimize deposition of heavy metals or other detonation byproducts concentrating on the hillside outside the SAFER.

The SAFER is designed with inner and outer blast doors to prevent fragmented material from leaving the facility. The blast doors would work dually to keep unwanted wildlife from entering the facility.

Design drawings of the SAFER are found in Section 2.3.3.1, Preferred Alternative – Safe Armaments Facility for Energetics Research, of the EA. A final design cannot be completed at this time because construction is dependent on site-specific geologic conditions that would be determined during pre-construction and construction activities. The Army does not anticipate any significant changes to the current design. ARDEC's analysis of the proposed SAFER is based partly upon preliminary bore samples of the rock and soils in the 1200 Area.

Summary of Anticipated Environmental Effects

Environmental resource impact ratings are based on current information and the assessment of the environmental consequences of implementing the Proposed Action at Picatinny Arsenal. Environmental resource areas consist of: Land Use & Utilities, Traffic & Transportation, Noise & Vibration, Air Quality, Geology & Soils, Water Resources, Wetlands, Biological Resources, Cultural Resources, Hazardous Waste & Hazardous Materials, Socioeconomics & Environmental Justice, and Human Health & Safety. A summary of these ratings is provided in Table FNSI-1.

Table FNSI-1. Summary of Direct/Indirect Consequences to Evaluated Resource Areas

Resource Area	Preferred Alternative	No Action Alternative
Land Use & Utilities	Short-term, indirect, minor adverse impacts during construction	No Impact
Traffic & Transportation	Short-term, minor increase in traffic volume on a relatively limited number of days during construction	No Impact
Noise & Vibration	Short-term, minor noise and vibration impacts during construction; however, noise and vibration impacts are anticipated to decrease during operation of the SAFER	No Impact
Air Quality	Temporary, direct, minor adverse impact on the local airshed during construction	Long-term, minor, indirect impacts on regional air quality from the increased use of fossil fuels used to transport materials and associated greenhouse gas (GHG) emissions
Geology & Soils	Short-term, direct, minor adverse impacts to the soil during construction with Mitigations to decrease sedimentation	No Impact
Water Resources	Short-term, direct, moderate adverse impacts to groundwater and surface water with Mitigations	No Impact
Wetlands	Long-term, indirect moderate adverse impacts to the wetland transition area	No Impact
Biological Resources	Short-term, direct, moderate adverse impacts with Mitigations	No Impact
Cultural Resources	No impact	No Impact
Hazardous Waste & Hazardous Materials	Long-term, direct, minor adverse impact	No Impact
Socioeconomics & Environmental Justice	Short-term, beneficial, direct impact	No Impact

Resource Area	Preferred Alternative	No Action Alternative
Human Health & Safety	Short-term, direct, minor adverse impacts; however, beneficial impact to safety, as it would eliminate the need for open air detonation and the transportation of experimental munitions on public roadways	Adverse impacts due to the need to transport experimental munitions to other facilities

Upon receipt of comments expressing concern regarding impacts to sensitive species, ARDEC continued consultation with the U.S. Fish and Wildlife Service (USFWS) regarding potential impacts to the Indiana bat (*Myotis sodalis*). In a letter dated August 13, 2012, USFWS concurred that the proposed SAFER project may affect, but is not likely to adversely affect, the Indiana bat.

In addition, at the request of the New Jersey Department of Environmental Protection (NJDEP) Endangered and Nongame Species Program (ENSP), ARDEC conducted a series of timber rattlesnake (*Crotalus horridus horridus*) and northern copperhead (*Agkistrondon contortrix contortrix)* surveys during April through August 2012, including a Hibernacula and Emergence Survey, an Early Basking Survey, and a Gestation and Birthing Site Survey. During these 2012 surveys, although snakes were observed within the 200-meter buffer area from Rock Storage Area B, no snakes were observed directly in areas where ground disturbance is proposed.

Finally, a hydrogeologic study was conducted for the SAFER project area in July 2012. The study report was revised on August 24 and October 16, 2012. This study included a pumping test, slug test, and modeling analysis. The study confirmed significant seasonal fluctuations in the groundwater table elevation and concluded that water management will be required during construction of the SAFER. Mitigation measures are discussed below.

Mitigation Measures

Construction activities, particularly rock blasting, excavation, and soil transport, could have varying levels of adverse impacts on biological resources and water resources. As a result, ARDEC has identified mitigation measures to reduce effects from construction to the environment below the level of significance. Such mitigation measures are required to be adopted in order to prevent significant adverse impacts to the environment. Further, ARDEC plans to conduct a rock feasibility study to confirm site stability prior to the construction of the chamber and adits. If the results of the study yield that the site is unfeasible to withstand construction and operation of the SAFER, ARDEC would seek other location alternatives.

Table FNSI-2 provides a list of all identified mitigation measures.

Table FNSI-2. Mitigations

Mitigation No.	Direct Effect	Mitigation(s)
Land Use & Utilities – N/A		
Traffic & Transportation – N/A		
Noise & Vibration – N/A		
Air Quality – N/A		

Mitigation No.	Direct Effect	Mitigation(s)
Geology & Soils		
1	Minor impact on Green Pond Brook from construction-related traffic, potentially increasing sediment loads	Install temporary silt fences to minimize traffic and construction-related erosion. In addition, implement additional measures as specified in the Erosion and Sediment Control Plan to be approved by the Morris County Soil Conservation District.
Water Resources		
1	Moderate impact with mitigation measures needed to avoid impacts to groundwater quality above water quality standards from SAFER construction activities	The dewatering contractor will develop mitigation measures, possibly to include obtaining a dewatering permit. Based on the results of the hydrogeologic study, dewatering may be needed to prevent contact between residual explosives and local groundwater during construction.
2	Moderate impact regarding the potential migration of nitrogen compounds resulting from residual explosives (e.g., ammonium nitrate/fuel oil [ANFO]) on excavation floor following blasted rock removal, and in soil stockpiles where blasted rock will be placed during construction	The mining contractor will be required to demonstrate and provide evidence that its methodology is at least 96% effective for consuming residual ANFO during blasting. If required, the mining contractor will develop mitigation measures for any remaining residual ANFO on the rock to be transported to the rock storage areas. A monitoring program will be developed prior to construction, and monitoring wells will be used to periodically assess ANFO concentrations and potential impacts on groundwater quality.
3	Inadequate monitoring could lead to discharge of contaminated groundwater to Green Pond Brook	Conduct sampling and analysis in accordance with the monitoring plan (baseline, construction, and operation) to ensure maintenance of water quality in Green Pond Brook. Monitoring wells will be installed and sampled downgradient of the SAFER site prior to construction to supplement the existing groundwater monitoring well network. The monitoring plan will include periodic monitoring of groundwater emanating from the SAFER to assess the effectiveness of mitigation measures. Additional controls will be implemented, as necessary, based on monitoring results and permitting requirements.
4	Erosion and sediment loading along Lower Gorge Road and Upper Gorge Road may impact Green Pond Brook during construction of the SAFER facility	Install temporary silt fences to minimize traffic and construction-related stream sedimentation. In addition, implement additional measures as specified in the Erosion and Sediment Control Plan to be approved by the Morris County Soil Conservation District.
5	Minor impact with SAFER design mitigation	Install a geo-liner beneath the SAFER main chamber to eliminate short-term and long-term migration of munitions combustion byproducts into the groundwater beneath the SAFER site. Install a concrete floor designed with drain to divert any build-up of moisture from the main chamber from transporting munitions combustion byproducts from the SAFER walls to the underlying soils. This floor would be an added measure of protection

Mitigation No.	Direct Effect	Mitigation(s)
		beyond the geo-liner, and would add stability for equipment transporting munitions to the SAFER chamber for detonation.
Wetlands – N/A		
Biological Resources		
1	Potential impacts on the Indiana bat and breeding birds during construction of the SAFER facility	Felling of trees at the SAFER site will be limited to the period between 16 November and 31 March. All construction blasting will be prohibited from one hour before sundown to one hour after sunrise from 1 April through 15 November.
2	Potential interaction between construction traffic and commonly encountered species, such as wood turtles, box turtles, and snakes	Provide driver training during initial construction worker assignments. Post speed limit signs (15 miles per hour) along Upper Gorge Road.
3	Potential impacts on the local timber rattlesnake and northern copperhead snake populations during construction of the SAFER facility	All personnel entering the construction site will be educated in identification and hazards of venomous snakes and procedures to be followed if a rattlesnake or copperhead is encountered. If a State-listed snake (i.e., timber rattlesnake, northern copperhead) is sighted during construction or operations, the Picatinny Natural Resource Manager will be notified. Rattlesnakes and copperheads will not be killed or molested. Signage with these prohibitions will be posted at the SAFER site and rock storage areas. Any felled trees and brush will be promptly removed and hauled away, or piled in areas away from construction and rock storage areas, and allowed to remain undisturbed in perpetuity. A minimum cleared buffer of 10 feet with no cover vegetation or rock will be maintained around the rock storage areas to eliminate the open interface habitat that snakes prefer. The use of Rock Storage Area B will be avoided to the extent practicable, particularly during the snakes' active season between 1 April and 31 Oct. If any activities in Rock Storage Area B occur between 1 April and 31 Oct, a NJDEP ENSP-qualified snake monitor will be present for the duration of the activities. The snake monitor will capture and relocate any observed snakes (and other listed wildlife) to an area outside the active workspace, according to NJDEP ENSP protocols. Passage points for snakes and other wildlife will be included in all silt fencing.

Mitigation No.	Direct Effect	Mitigation(s)
4	Potential impacts on the local brook trout population during construction of the SAFER facility	Conduct sampling and analysis in accordance with the monitoring plan (baseline, construction, and operation) to ensure maintenance of water quality in Green Pond Brook. Install temporary silt fences to minimize traffic and construction-related erosion. Additional controls will be implemented if necessary based on monitoring results and permitting requirements (e.g., Erosion and Sedimentation Control Plan).
Cultural Resources – N/A		
Hazardous Wastes & Hazardous Materials – N/A		
Socioeconomics & Environmental Justice – N/A		
Human Health & Safety – N/A		

ARDEC will monitor implementation of all mitigation measures identified in this EA in accordance with the Council on Environmental Quality (CEQ) guidance, *Appropriate Use of Mitigation, Monitoring, and Mitigated FONSIs*, dated January 2011.

Anticipated Cumulative Environmental Impacts

This analysis determined the Proposed Action of building and operating the SAFER with the mitigation measures described would have potentially minor to moderate cumulative impacts on the environmental components assessed in this EA. Chapter 4, Cumulative Impacts Assessment, provides details on projects that were considered to occur within a practical timeframe (past, present, and reasonably foreseeable future) of constructing the SAFER. Chapter 4 further provides an impact analysis of the combined impacts from constructing and operating the SAFER when considered together with the impacts generated from other projects identified.

Conclusion

Based on review of the information contained in the EA, the respective decision makers have determined that, with the implementation of specified mitigation measures, building and operating the SAFER would have no significant effects on human health or the natural environment, and would have no significant cumulative effects on human health or the natural environment. ARDEC has met the requirements of NEPA under Section 102(2)(c) and, therefore, may proceed with the construction and operation of the proposed SAFER. The preparation of an Environmental Impact Statement (EIS) is not required.

Point of Contact

For further information, please direct requests to Mr. Peter Rowland of the Picatinny Public Affairs Office, via mail at RDAR-CPA, Picatinny Arsenal, NJ 07806-5000, via telephone at (973)724-6364, or via e-mail at: usarmy.picatinny.ardec.mbx.picatinny-public-affairs@mail.mil.

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Environmental Assessment

Building and Operating a Safe Armaments Facility for Energetics Research (SAFER) at Picatinny Arsenal, New Jersey

December 2012

Prepared by

Booz Allen Hamilton

EXECUTIVE SUMMARY

The U.S. Army Armament Research, Development and Engineering Center (ARDEC) proposes to recommence research and development (R&D) of insensitive munitions (IM) at Picatinny Arsenal, New Jersey.

In April 2008, during open air detonation of IM, a fragment of an artillery shell traveled off the boundaries of the Picatinny Arsenal, damaging private property. Subsequently, ARDEC ceased open air detonation of IM at Picatinny Arsenal until a time when this type of detonation could be conducted in a manner that does not impact the safety of the public. ARDEC still has the mission of ensuring Soldier safety through the R&D of IM and fielding safe technology to the operational environment (e.g., Afghanistan). ARDEC, in proposing to continue IM R&D at Picatinny Arsenal, is committed to designing, constructing, and operating a facility capable of containing 100 percent of munitions fragments. Development of such a facility requires additional logistical, transportation, and security measures adding to the research costs and schedule, but is necessary to ensure an adequate and safe R&D environment.

This Environmental Assessment (EA) identifies and evaluates alternatives for resuming IM R&D activities, including detonation, at Picatinny Arsenal.

The Preferred Alternative would build an underground R&D facility, also known as the Safe Armaments Facility for Energetics Research (SAFER), within the Gorge Test Area at the Picatinny Arsenal. The proposed design for the SAFER chamber includes concrete flooring lined with a geo-liner to eliminate the potential for migration of munitions constituents or combustion byproducts to groundwater below the installation. The SAFER would also have blast doors to prevent munitions fragments from exiting the chamber.

ARDEC ultimately rejected three of the four alternative designs considered, because they did not meet the operational criteria required for this project. ARDEC also analyzed alternative site locations for the SAFER at Picatinny Arsenal, but those sites were discarded from further evaluation due to potential inability to reduce threats of contamination or exposure to the natural environment. These additional site locations were also eliminated due to excessive costs that, if implemented, would not present any additional protection above what is proposed under the Preferred Alternative. The EA also evaluates a No Action Alternative for not constructing the SAFER.

The EA was released for public comment on January 11, 2012. A total of 220 public comments were received. All comments and responses are included in Appendix G of this EA. ARDEC undertook additional studies and consultation activities as a result of the comments received.

Table ES-1 summarizes the potential impacts to the human and natural environment from constructing and operating the SAFER at Picatinny Arsenal. Several mitigation measures are identified in Chapter 3, Affected Environment and Consequences, to minimize potential adverse effects from constructing and/or operating the SAFER. These mitigation measures must be adopted to mitigate potentially significant environmental consequences down to a rating of moderate impact(s) or lower.

ARDEC will monitor implementation of all mitigation measures identified in this EA in accordance with the Council on Environmental Quality (CEQ) guidance, *Appropriate Use of*

Mitigation, Monitoring, and Mitigated FONSIs, dated January 2011. In addition, ARDEC has identified Best Management Practices (BMPs) for several resource areas to further reduce impacts. Implementation of these BMPs is not required because there would be no significant impacts to those resource areas, but would help further minimize impacts of the Proposed Action.

Table ES-1. Comparison of Potential Impacts from Constructing and Operating the SAFER

Resource Area	Preferred Alternative	No Action Alternative
Land Use & Utilities	Short-term, indirect, minor adverse impacts during construction	No Impact
Traffic & Transportation	Short-term, minor increase in traffic volume on a relatively limited number of days during construction	No Impact
Noise & Vibration	Short-term, minor noise and vibration impacts during construction; however, noise and vibration impacts are anticipated to decrease during operation of the SAFER	No Impact
Air Quality	Temporary, direct, minor adverse impact on the local airshed during construction	Long-term, minor, indirect impacts on regional air quality from the increased use of fossil fuels used to transport materials and associated greenhouse gas (GHG) emissions
Geology & Soils	Short-term, direct, minor adverse impacts to the soil during construction with Mitigations to decrease sedimentation	No Impact
Water Resources	Short-term, direct, moderate adverse impacts to groundwater and surface water with Mitigations	No Impact
Wetlands	Long-term, indirect moderate adverse impacts to the wetland transition area	No Impact
Biological Resources	Short-term, direct, moderate adverse impacts with Mitigations	No Impact
Cultural Resources	No impact	No Impact
Hazardous Waste & Hazardous Materials	Long-term, direct, minor adverse impact	No Impact
Socioeconomics & Environmental Justice	Short-term, beneficial, direct impact	No Impact
Human Health & Safety	Short-term, direct, minor adverse impacts; however, beneficial impact to safety, as it would eliminate the need for open air detonation and the transportation of experimental munitions on public roadways	Adverse impacts due to the need to transport experimental munitions to other facilities

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LIST OF ACRONYMS

ADNL	A-Weighted Day-Night Levels
AEC	Army Environmental Center
ANFO	Ammonium Nitrate-Fuel Oil
APCU	Air Pollution Control Unit
APE	Area of Potential Effects
ARDEC	Armament Research, Development and Engineering Center
BA	Biological Assessment
BOD	Biochemical Oxygen Demand
CAA	Clean Air Act
CCDC	Cold Confined Detonation Chamber
CDC	Child Development Center
CDNL	C-Weighted Day-Night Level
CEQ	Council On Environmental Quality
CFR	Code of Federal Regulations
CH4	Dioxide (CO2), Methane
CHPPM	Center For Health and Promotion and Preventative Medicine
CNC	Computer-Controlled Numerical Comparator
CO	Carbon Monoxide
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
CPI	Continental Placer Inc.
DDMI	Diavik Diamond Mines Inc.
DOT	Department of Transportation
E2PM	E2 Project Management
EA	Environmental Assessment
EIS	Environmental Impact Statement
ENSP	Endangered and Nongame Species Program
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ESCA	Endangered Species Conservation Act
ESMP	Endangered Species Management Plan
EWMTD	Energetics, Warheads and Manufacturing Technology Directorate
FCTS	Fragment Containment Test Stand
FNSI	Finding of No Significant Impact

FONSI	Finding Of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
GHG	Greenhouse Gas
GHGRP	Greenhouse Gas Reporting Program
GIS	Geographic Information System
HE	High Explosive
IBAT	Indiana Bat
ICRMP	Integrated Cultural Resources Management Plan
IED	Improvised Explosive Device
IHWMP	Installation Hazardous Waste Management Plan
IM	Insensitive Munitions
INRMP	Integrated Natural Resources Management Plan
IONMP	Installation Operational Noise Management Plan
LAN	Local Area Network
LOS	Level of Service
MCL	Maximum Contaminant Level
MIDAS	Munitions Items Disposition Action System
MSL	Mean Sea Level
MTTU	Mobile Transportable Treatment Chamber
NAAQS	National Ambient Air Quality Standard
NEPA	National Environmental Policy Act of 1969
NEPA	Policy Act
NEW	Net Explosive Weight
NHP	Natural Heritage Program
NJAAQS	New Jersey Ambient Air Quality Standards
NJDEP	New Jersey Department of Environmental Protection
NJDFW	New Jersey Division of Fish & Wildlife
NO	Nitrous Oxide
NO2	Nitrogen Dioxide
NPL	National Priority List
NRHP	National Register of Historic Places
OB/OD	Open Burning and Open Detonation
OBODM	Open Burn/Open Detonation Dispersion Model
ONJSC	Office of the New Jersey State Climatologist
PHS&T	Packaging, Handling, Storage, and Transportation
PMSA	Primary Metropolitan Statistical Area

POL	Petroleum/Oils/Lubricants
PPV	Peak Particle Velocity
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
RONA	Record Of Non-Applicability
SAFER	Safe Armaments Facility for Energetics Research
SAFER	Safe Armaments Facility For Energetics Research
SCAQMD	South Coast Air Quality Management District
SERDP	Strategic Environmental Research and Development Program
SHPO	State Historic Preservation Office
T&E	Testing and Evaluation
TOC	Total Organic Carbon
TPY	Tons Per Year
TSP	Total Suspended Particulates
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USEPA/DPG	U.S. Environmental Protection Agency/Dugway Proving Ground
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
UXO	Unexploded Ordnance
VOC	Volatile Organic Compounds
XO	Explosive Ordnance
YOY	Young-Of-The-Year

1.0 PURPOSE AND NEED

1.1 Introduction to the Mission

Picatinny Arsenal is located in Morris County, New Jersey (Figure 1-1). The installation lies just west of the greater New York/New Jersey Metropolitan Area, 32 miles northwest of Newark, and 42 miles west of New York City. Local boroughs in the immediate vicinity are Wharton (1 mile), Dover (3 miles), and Rockaway (5 miles). Interstates 80, 280, and 287 comprise the major travel thoroughfares in the area. State Route 15 forms the southern boundary of the installation and provides access to the installation's main gate.

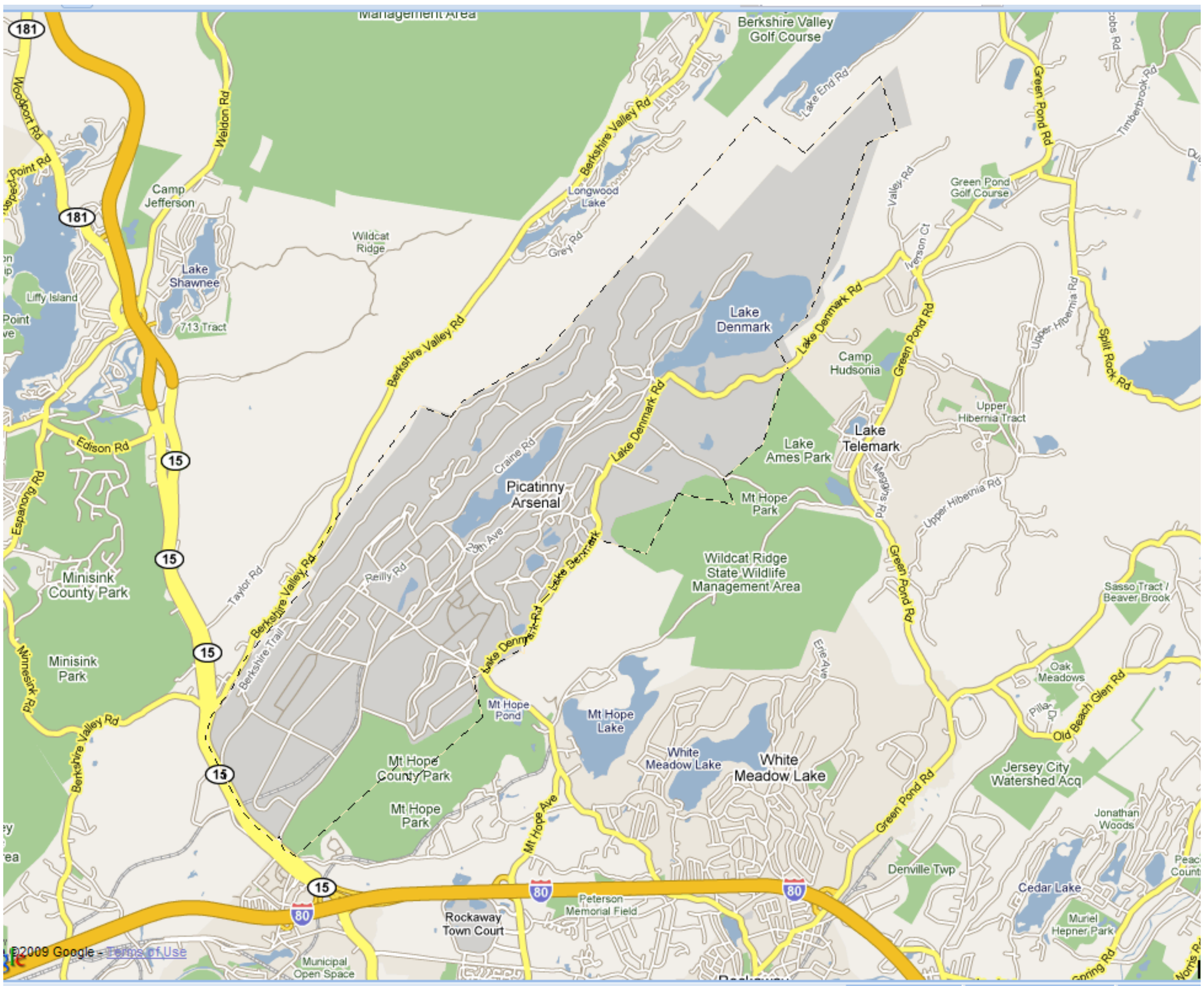

Figure 1-1. Street Map View of Picatinny Arsenal
(Army Mapper; October 2009)

The U.S. Army Armament Research, Development and Engineering Center (ARDEC) encompasses the competency-based Energetics, Warheads and Manufacturing Technology Directorate (EWMTD). This directorate operates and maintains prototype facilities to develop, prove out, and implement these technologies in support of ARDEC mission responsibilities of fielding armaments to the Warfighter in a timely fashion. Scientists and engineers at Picatinny Arsenal, integrate state-of-the-art logistics enhancements and manage explosives safety projects to develop and test "fixes" in munitions items that reduce the explosive hazards posed by those munitions items to Warfighters.

In particular, the Army Insensitive Munitions (IM) Program and the Research and Development Army IM Improvement Program seek to adopt an inventory of the world's most lethal ground force munitions that perform as they are intended, but are less prone to violent reaction when subjected to impact from bullets and fragments, heat from fire, and shock from neighboring explosions. The IM Program ultimately improves safety and survivability for the Soldier in the field.

ARDEC proposes construction, operation, and maintenance of an underground Safe Armaments Facility for Energetics Research (SAFER) at Picatinny Arsenal within the Gorge Test Area. The proposed SAFER would support ARDEC's mission requirements for the research and development (R&D) of IM.

This Environmental Assessment (EA) analyzes and documents the potential site-specific impacts associated with the construction, operation, and maintenance of the proposed SAFER within the Gorge Test Area at the Picatinny Arsenal. This EA was prepared pursuant to the National Environmental Policy Act (NEPA) (42 United States Code [USC], Sections 4321); the *CEQ - Regulations for Implementing NEPA*; 40 Code of Federal Regulations (CFR), Parts 1500 through 1508); and 32 CFR, Part 651, "Environmental Effects of Army Actions."

1.2 Purpose and Need

ARDEC requires an R&D facility with the capability to support long-term Department of Defense (DoD) explosive and IM R&D requirements. Evaluation requirements are discussed in greater detail in Section 2.2, Proposed Action, and include slow cook-off, bullet and fragment tests, shape charge detonation, sympathetic detonation, and explosive ordnance R&D. The continuous development and improvement of conventional munitions and their formulations require a facility that operates year-round; permits testers to efficiently and quickly conduct performance evaluations on IM items; provides qualitative and quantitative results to support engineering changes, if necessary; and fields IM to the Military Services.

1.3 Scope of the Analysis

This EA addresses environmental and socioeconomic impacts of the construction, operation, and maintenance of an underground test facility (i.e., the SAFER) and alternatives for consideration. The level of analysis for this EA is limited to those environmental resource areas where there is a suspected potential effect based upon anticipated activities required to meet the need of the facility. Resource categories analyzed include the following: Wetlands, Land Use & Utilities, Traffic & Transportation, Noise & Vibration, Air Quality, Geology & Soils, Water Resources, Wetlands, Biological Resources, Cultural Resources, Hazardous Waste & Hazardous Materials, Socioeconomics & Environmental Justice, and Human Health & Safety.

1.4 Coordination with Agencies

ARDEC has coordinated and consulted with Federal Government and New Jersey State agencies to obtain information and feedback pertaining to the construction, operation, and maintenance of the SAFER on Picatinny Arsenal. The list below identifies the Federal Government and New Jersey State agencies ARDEC invited to participate in the development and review of this EA:

- Picatinny Arsenal Directorate of Public Works, Environmental Affairs Division
- U.S. Fish & Wildlife Service (USFWS)
- New Jersey Department of Environmental Protection (NJDEP)
- New Jersey State Historic Preservation Office (SHPO)

1.5 Decision to Be Made

This EA supports ARDEC's decision-making process relative to the Proposed Action. Specifically, ARDEC must decide whether to construct, operate, and maintain the proposed SAFER at the Picatinny Arsenal.

In addition to the considerations related to the requirements of NEPA and applicable regulations, ARDEC must consider the military mission and natural resource management goals of the installation. The primary goals of natural resource management activities at the Arsenal are to provide training and research facilities for the employees of the proposed facility, as well as to maintain the overall biodiversity of the indigenous species and the surrounding forested and wetlands habitats, including environmental protection for soil, water, flora, and fauna (particularly threatened, endangered, and sensitive species) and other resources, in compliance with applicable Federal and State regulations (ARDEC, 2005).

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

This chapter describes a Proposed Action that would allow ARDEC to construct, operate, and maintain an underground fragment-containing SAFER in the Gorge Test Area at Picatinny Arsenal. The Proposed Action would support ARDEC's mission for safely conducting R&D for IM on Picatinny Arsenal, while eliminating the risk of primary and secondary fragments leaving the installation.

2.2 Proposed Action

The testing of IM within the proposed SAFER must meet the mission requirements of ARDEC to research, develop, and classify IM in accordance with Department of the Army Pamphlet (DA PAM) 70-3, *Army Acquisition Procedures* (U.S. Army, 2009) and DA PAM 385-64, *Ammunition and Explosives Safety Standards* (U.S. Army, 2011).

Any facility designed to accommodate this type of R&D must be capable of accommodating the test procedures required by the Army's IM program criteria. Section 2.2.2, Facility Design Requirements, discusses the basic engineering design requirements for such a facility to withstand the IM R&D proposed by ARDEC.

Section 2.2.3, Facility Location Requirements, discusses the location requirements at Picatinny Arsenal for the proposed SAFER. Location requirements are based, not only on human safety and health, but also on the ability for the right technical staff to be within reasonable proximity to the proposed test facility to manage the IM R&D program.

2.2.1 *Criteria for Conducting Munitions R&D*

The R&D planned for this facility include IM conventional munitions and their formulations. The types of conventional munitions include: 40mm grenade projectiles, 120mm and below high explosive (HE) mortar projectiles, 105mm artillery projectiles, 105mm and 120mm chemical energy tank main gun projectiles, and 155mm HE artillery projectiles. Additional munitions items tested at this facility could include mines and sub-munitions developed in ARDEC's research and development (R&D) process; and include propellants, energetics, pyrotechnics, and standard Army munitions. All munitions, explosives, and other items could produce blast effects and fragments that must be studied and contained within the test area.

Explosive and IM R&D encompasses a variety of procedures, such as slow cook-off, fragment impact, bullet impact, shape charge, sympathetic detonation, and explosive ordnance testing, defined as follows:

- **Slow Cook-off:** To determine the auto-ignition temperatures at which an energetic item self-ignites and how the munitions/packaging container reacts to the auto-ignition. These tests are performed on developmental packaging and munitions, and are rated against IM criteria.
- **Bullet and Fragment Test:** To determine the sensitivity of munitions to the impact of a .30 or .50 caliber bullet, or 0.5" fragment fired from a gun.

- **Shape Charge:**[1] To measure the reaction of ordnance to shape charge jet impact. The item to be detonated should be of production standard, and either packaged or unpackaged (as agreed by the appropriate national authorities).
- **Sympathetic Detonation:** To determine the sensitivity of one or more munitions items to the detonation of an adjacent similar munitions item. If, for example, the accidental detonation and fragmentation of one munitions item could detonate others stored in the vicinity (e.g., in the same magazine, on a launching ramp, during the operational weapon system deployment), the consequences of the event could be catastrophic, resulting in potential loss of life and equipment.
- **Explosive Ordnance Testing:** To statically function an ordnance item in order to observe and record the results of such function. Ordnance items may not be destroyed, but may be rendered unsafe; may have a low order detonation and scatter fragments; or may catch fire and be consumed.

Munitions detonations would occur up to four times per week (four separate days, or twice per day on two separate days) for a total of 208 detonation events per year. Tests would be scheduled during normal working hours and during the normal work week, Monday through Friday.

2.2.2 *Facility Design Requirements*

Section 2.2.1 lists the munitions to be tested and evaluated within the SAFER. The maximum usage anticipated for this facility is up to six 155mm HE artillery projectiles at one time (Lusardi, 2009).

The proposed facility must be able to withstand up to 150 pound Net Explosive Weight[2] (NEW) R&D capability (CPI, 2009a). As a point of reference, the NEW for one M795 Projectile 155mm HE is 23.8 pounds (MIDAS, 2009).[3]

The detonation of munitions items generates hazards, including fragmentation from shell casings, and causes exposure to impulse noise and combustion byproducts from the constituents that make up the explosive and propellant formulation. These hazards would be accounted for in the facility design to be protective of test personnel, the surrounding community, and the natural and built environment at Picatinny Arsenal.

The SAFER must include a chamber that can withstand the impact of a 5 pound non-traditional fragment travelling at 5,000 feet per second, or a 13 pound fragment travelling at 4,300 feet per second. This requirement eliminates primary and secondary fragments from exiting the facility and endangering the public.

The chamber must be able to meet R&D requirements, including accommodating test equipment (e.g., blast detectors, high speed cameras, light/gas detection equipment, thermal flux gauge) that

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[1] A shaped charge is an explosive charge shaped to focus the effect of the explosive's energy. Various types are used to cut and form metal, initiate nuclear weapons, and penetrate armor. A typical modern lined shaped charge can penetrate armor steel to a depth of 7 or more times the diameter of the charge's cone (cone diameters, CD), though greater depths of 10 CD and above are now feasible.

[2] “NEW” is the total weight of the explosive charge portion of any munitions item.

[3] The total munitions’ weight is approximately 103 pounds.

provide for the measurement of surface heat transfer. This requirement allows ARDEC to adequately study the effects of IM and make adjustments to the IM manufacturing process, as needed, to improve munitions safety features.

The facility must be large enough to accommodate R&D that yields accurate data on munitions item fragmentation for evaluation (e.g., the analysis of data from blast gages and from video produced from high speed cameras). At a minimum, the primary test chamber would be 100 feet in diameter and 50 feet in height to conduct proper test methodologies.

The facility must be sustainable over the long-term and able to withstand year-round munitions testing with low-maintenance costs.

2.2.3 *Facility Location Requirements*

The facility location must have the space capable to construct the SAFER and fall within reasonable cost parameters. The facility location must be accessible year-round to personnel in medium to light-size trucks during the operations phase.

The facility must be located on Picatinny Arsenal to be accessible by mission scientists and test technicians knowledgeable on the program. This requirement supports a more efficient, timely, and safer R&D program to responsibly develop and field IM to Soldiers using them in the operational environment (e.g., Afghanistan).

2.3 Alternatives Considered

2.3.1 *Introduction*

The identification, consideration, and analysis of alternatives are integral to objective decision-making and are central to the NEPA process. To be carried forward for analysis, reasonable alternatives must be able to meet the screening criteria established in Section 2.2 for conducting ARDEC's R&D mission.

After conducting its initial evaluation, ARDEC determined that three of the four alternatives considered initially did not satisfy some or all of the screening criteria and, thus, were not carried forward for analysis. These alternatives were: a Mobile Transportable Treatment Unit; a Cold Confined Detonation Chamber; and an Above-Ground, Stand-Alone, Fragment Containment Test Stand (see Table 2-1).

Two alternatives, including the No Action Alternative, were proposed for evaluation in meeting the purpose and need of the Proposed Action. The Preferred Alternative is the construction, operation, and maintenance of a SAFER in the 1200 Area within the Gorge at the Picatinny Arsenal.

ARDEC and Picatinny Department of Public Works personnel evaluated four separate locations within the Gorge Test Area for constructing the SAFER. Three of the locations were not carried forward for analysis, due to one or more limitations, as described in the following sections.

2.3.2 *Alternatives Considered but Not Carried Forward for Analysis*

NEPA requires that all reasonable alternatives for Federal actions be considered. ARDEC considered several combinations of alternatives to the proposed facility design and location.

These alternatives were eliminated because they failed to fully satisfy the purpose and need, did not meet the objectives for the Proposed Action, or were otherwise infeasible. Alternatives considered but not carried forward are identified in Tables 2-1 and 2-2.

2.3.2.1 Resumption of Open Air Detonation at Picatinny Arsenal

This alternative would resume open air IM detonation at Picatinny Arsenal, in accordance with previously established and approved safety practices and procedures. Under this alternative, ARDEC would not take any action to construct, operate or maintain any facility on Picatinny Arsenal to support underground explosive or IM R&D, and existing, open air facilities would be utilized to resume testing. Open air detonation at Picatinny Arsenal was halted in 2008 due to public safety concerns, when a piece of artillery fragment traveled outside the boundaries of the installation, damaging private property. This alternative would not address the public safety concerns that originally led to the cessation of open air detonation, and has not been carried forward for analysis.

2.3.2.2 Mobile Transportable Treatment Unit

The mobile transportable treatment chamber (MTTU) is accessed for setting up shots by a cylindrical door section that slides open on wheels. When open, it slides over a part of the chamber and, when closed, it butts up against the end cap. The MTTU has a replaceable liner composed of doughnut-shaped liner segments that can be individually replaced if damaged. The unit uses no electricity, and has no sensors or motors. The MTTU is equipped with a gun port and camera ports. Guns, projectile launchers, instrumentation, and associated equipment and procedures already in use for IM R&D can be used in the MTTU.

The MTTU is mobile, captures all fragments, attenuates noise, captures all blast effects, and does not propagate ground shock. However, it is not air/emission tight. It can support 155mm or smaller IM tests, and can perform slow cook, bullet impact, fragment impact, sympathetic detonation, and associated tests. It cannot support shape charge, improvised explosive device (IED), and some explosive tests.

2.3.2.3 Cold Confined Detonation Chamber

A Cold Confined Detonation Chamber (CCDC) is a containment vessel designed to contain all blast and fragments. Past CCDCs (e.g., Donovan and Kobe units) have been useful for small munitions demilitarization, but lack the robustness for high-volume, large munitions demolition. A CCDC consists of a detonation chamber, expansion tank, and air pollution control unit (APCU). The detonation chamber is a double-walled, steel box structure with silica sand fill between the inner and outer walls. The detonation chamber has exterior dimensions of approximately 6 feet, 7 inches wide by 6 feet, 7.5 inches long by 7 feet, 11 inches high and an interior volume of 125 cubic feet. Abrasion resistant armor plating lines the interior walls and ceiling, and a minimum of 6 inches of pea gravel is maintained on the chamber floor. The expansion chamber has dimensions of 8 feet by 8 feet by 8 feet, and has an interior volume of 170 cubic feet.

The detonation chamber can withstand detonations equivalent to 10 pounds of HMX or 13 pounds of TNT equivalent and explosive items with a fragment hazard of less than or equal to an 81 mm HE mortar or munitions with diameters up to and including a 105 mm projectile with installation of three quarter inch armor plates. The silica sand in the walls and the pea gravel on the floor are used to absorb shock created by the detonation. The expansion chamber mitigates overpressure and heat from the detonation prior to the air being discharged through the APCU. The APCU collects particulates that can contain heavy metals, energetic, and detonation by-products. Compressed air is introduced into the detonation chamber at a rate of 100 cubic feet per minute at pressures of about 90 to 100 pounds per square inch after detonation (DeMil International, 2000).

For use at Picatinny Arsenal, this CCDC can be equipped with provisions for high-speed video recording, instrumentation for blast pressures, and other metrics critical to validating functional performance during detonation, and an off-gas treatment system.

2.3.2.4 Fragment Containment Test Stand (FCTS)

Building a fully-enclosed, steel-reinforced concrete Fragment Containment Test Stand (FCTS) at Test Range 616 on Picatinny Arsenal would consist of a floor, walls, and roof made of four-foot thick steel-reinforced concrete. The floor and interior walls of an FCTS would be lined with 4-inch thick steel plates and a ceiling with 2-1/2 inch thick steel plates. The FCTS would have a solid steel blast door, specially-designed ports for cameras, and four ceiling vents. The ports and vents have design features that would ensure no fragments leave the containment test stand. The FCTS would require achieving a 99.9999999% confidence level of containing fragments generated during munitions detonation.

The facility would be used to conduct static detonation tests of high explosive projectiles and warheads of 155 mm and smaller. It would also be used to support slow cook-off, fragment impact, bullet impact, shape charge jet impact, and static functioning tests for 60mm, 81mm, 105mm, 120mm, and 155mm HE munitions.

This facility does not meet the criterion for test chamber size or long-term sustainability. ARDEC requires a facility that could be fully utilized into the foreseeable future, while the operations and maintenance of the facility remains steady. The FCTS would potentially continue to degrade over time and is projected to require regular costly maintenance of the specialized interior steel reinforced concrete walls.

Table 2-1. Alternative Facility Types Considered But Not Carried Forward for Analysis

Screening Criteria	Mobile Transportable Treatment Unit	Cold Confined Detonation Chamber	Above-ground, Stand-Alone, Fragment-Containment Test Stand
Withstand energy generated from 150 lbs NEW	Meets this criterion	Does not meet this criterion	Meets this criterion
Withstand impact of 5 lbs fragment travelling 5,000 feet/sec	Meets this criterion	Meets this criterion	Meets this criterion
Withstand impact of 13 lbs fragment travelling 4,300 feet/sec	Meets this criterion	Meets this criterion	Meets this criterion
Accommodate R&D equipment (e.g., cameras, light/gas detector, thermal flux gage, blast detector)	Does not fully meet this criterion	Does not fully meet this criterion	Meets this criterion

Screening Criteria	Mobile Transportable Treatment Unit	Cold Confined Detonation Chamber	Above-ground, Stand-Alone, Fragment-Containment Test Stand
Facility size large enough to accommodate full suite of munitions detonation (100 feet x 50 feet)	Does not meet this criterion	Does not meet this criterion	Does not meet this criterion
Long-term sustainability	Meets this criterion	Meets this criterion	Does not meet this criterion

2.3.2.5 Alternative SAFER Locations

Since 2008, ARDEC has been working with certified contractors (including geologists and hydrogeologists) to identify a feasible location within the Gorge Test Area of Picatinny Arsenal to construct and operate the SAFER. The Gorge Test Area is the only area on Picatinny Arsenal permitted for R&D of this nature. A site is first identified using Geographic Information System (GIS) mapping of the Gorge; then the site is walked to gather real-time, on-the-ground information as to on-site topography and visually noticeable geological formations, and to determine the presence of surface water or evidence of near-surface groundwater (which would inhibit excavation and sub-surface construction).

ARDEC found four such sites, but it eliminated three sites that did not meet the screening criteria, for the reasons described below. The site selected meets the screening criteria established in Section 2.2 for conducting ARDEC's R&D mission, as well as environmental requirements. Due to the nature of the R&D proposed within the SAFER, there must be sufficient protection from fragments leaving the test area, as well as suitable space to conduct and measure test effects (e.g., cameras, detection equipment).

For these reasons, the underground proposed facility would be located where design features, such as main chamber depth (see Figures 2-1 and 2-2) and access points (adits), could be adjusted easily; avoid potential impacts to groundwater; and ensure the impulse force generated by test detonations inside the main chamber would not destabilize the chamber superstructure, causing a cave in. Therefore, the site selected would be large enough to accommodate full-scale construction of the SAFER, as well as a dewatering system to maintain sufficient separation between the blasting surface and shallow groundwater. The dewatering system would be used only as needed to facilitate SAFER construction and/or operation. The bullets below and Table 2-2 provide the analysis of these alternative sites eliminated.

- Site 1 was the initial proposed location along Gorge Road near Test Area 1222. Road access is up to elevation of 100 feet above the floor of the Gorge, and ground surface elevation is approximately 850 to 875 feet above mean sea level (MSL). Groundwater depth at this location is as little as 0.4 feet below ground surface (bgs). This site was not carried forward for analysis, due to its shallow depth to groundwater.
- Site 2 is located within Green Pond Brook and wetlands buffers and, therefore, was not carried forward for analysis.

- Site 3 is located approximately 2,500 feet northeast of Site 1 and approximately 500 feet east of a swamp at an elevation of 975 feet. This site was not carried forward for analysis, because it is not suitable for the construction of the SAFER and is in close proximity to groundwater.

Table 2-2. Alternative SAFER Locations Considered But Not Carried Forward for Analysis

Screening Criteria	Site 1	Site 2	Site 3
Located outside of wetlands buffer zone	Does not meet this criterion	Does not meet this criterion	Meets this criterion
Site does not exhibit shallow depth to groundwater	Does not meet this criterion	Does not meet this criterion	Does not meet this criterion

2.3.3 *Alternatives Considered for Analysis*

ARDEC identified one feasible location within the Gorge Test Area at Picatinny Arsenal that meets the SAFER screening criteria. Section 2.3.3.1 provides information on the selected site. Section 2.3.3.2 presents the No Action Alternative. These are the only two alternatives carried forward for analysis in this EA.

2.3.3.1 Preferred Alternative – Safe Armaments Facility for Energetics Research

The Preferred Alternative is to construct, operate, and maintain an underground fragment-containing SAFER in the Gorge Test Area at Picatinny Arsenal at the 1200 Area test location.

SAFER Design

The entrance of the proposed facility would be a pre-split face in the hillside approximately 50 feet high and 100 feet wide. Twin tunnels would be mined into the hillside, each with a nominal cross-section of 15 to 20 feet wide and 20 feet high. Facing the notch, the left tunnel would rise to intersect the top of the circular chamber to allow rock bolting and scaling of the flat roof. The right tunnel would be driven at a decline; this tunnel would be used to remove blasted stone from the chamber. The test chamber would be approximately 100 feet in diameter and 50 feet high.

The floor of the right access entry would be on a decline toward the chamber entrance into an outside collection basin. The floor of the left access entry would be on an incline, and drainage would collect in the face-up area.[4] The floor of the test chamber would be concrete and scored to reduce the impact from munitions detonations on the stability of the design. A French drain design would be imprinted in the concrete where the flooring meets the cave walls to re-direct moisture from the walls to the collection basin down gradient of the test chamber.[5] A geo-liner would be installed beneath the cave floor to act as a redundant system that eliminates any potential for contaminants to migrate through cracks in the concrete to the water table. Similar

[4] It is anticipated that dewatering may be needed due to seasonal seepage from the ceiling and walls, and internal drainage features along with periodic emptying of a sump within the chamber are planned. These are design details that are yet to be finalized.

[5] The Faceup area would be sloped slightly, away from the entrance to the chamber, and a small berm would likely be placed at the entrance to keep storm water from entering. Details would be confirmed before issuing a final design for the construction of the test facility.

geo-liners are used in the construction of waste disposal landfills to prevent leachate from reaching public drinking water supplies. Water in the collection basins located outside the cave entrance would be regularly removed for treatment at the pink water treatment plant on the Arsenal, which treats munitions-contaminated waste water. Potential energetic materials to be tested are included in the Groundwater Modeling Report contained in Appendix B of this EA.

The left-facing tunnel would serve as a ventilation shaft. After construction, it would terminate in a vertical ventilating stack, equipped with filter and fan to ensure against fragments leaving the facility and to minimize deposition of heavy metals or other detonation byproducts concentrating on the hillside outside the SAFER.

Inner and outer blast doors would be installed to prevent fragmented material from leaving the facility and would dually work to keep unwanted wildlife from entering the facility. The design of the SAFER doors ensures that wildlife would not be able to enter the SAFER chamber. The doors are designed with 1-3/4-inch commercial polyurethane insulated overhead doors with a PVC strip and cap between sections to resist air infiltration and provide a tight fit. The blast doors would also minimize concussive forces acting on the roof. The actual thickness of these stainless steel doors and the method of how they are hung would be based on the actual geology of the SAFER location. Slight variations in the final design may be needed. However, ARDEC would ensure all required mitigation measures would be built into the final design. Power would be delivered to the SAFER via an industrial generator unit. No personnel would be on the site during detonation.

Figures 2-1 and 2-2 below depict plan and cross-section views of the proposed SAFER facility. The final design would be dependent upon the rock layers and their properties encountered during excavation. Therefore, the final design would not be available until the rock feasibility study (discussed below) is complete. Nevertheless, ARDEC does not anticipate a significant change from the proposed design depicted in this EA.

Site Preparation

In 2010, ARDEC commissioned a private firm to drill approximately 10 boreholes throughout the proposed SAFER location and better characterize information on the site geology. Samples of the rock and soils were sent to a lab to determine rock composition, and undergo fracture and compression testing. These tests helped to determine if the site could potentially be excavated and built to withstand a cave-in. Borehole samples were also studied to account for different rock layers. For example, if a substantially sized rubble zone was found above a more stable rock layer, the site could still present too high a risk of cave-in.

These initial characterization tests yielded favorable information about the site and provided ARDEC with enough confidence to move forward with its NEPA analysis and further site characterization studies. More information on these initial tests is provided in Section 3.6, Geology & Soils, and Section 3.7, Water Resources.

ARDEC contracted for the below follow-on studies to further substantiate use of this location (more detail on individual studies is provided in the cited sections of the EA):

- Wetlands delineation (Section 3.8, Wetlands)
- Review of rock storage areas (Section 3.3, Traffic & Transportation; Section 3.6, Geology & Soils; and Section 3.7, Water Resources)

- Indiana bat survey (Section 3.9, Biological Resources)
- Rattlesnake survey and northern copperhead survey (Section 3.9, Biological Resources)
- Cultural resources surveys (Section 3.10, Cultural Resources)

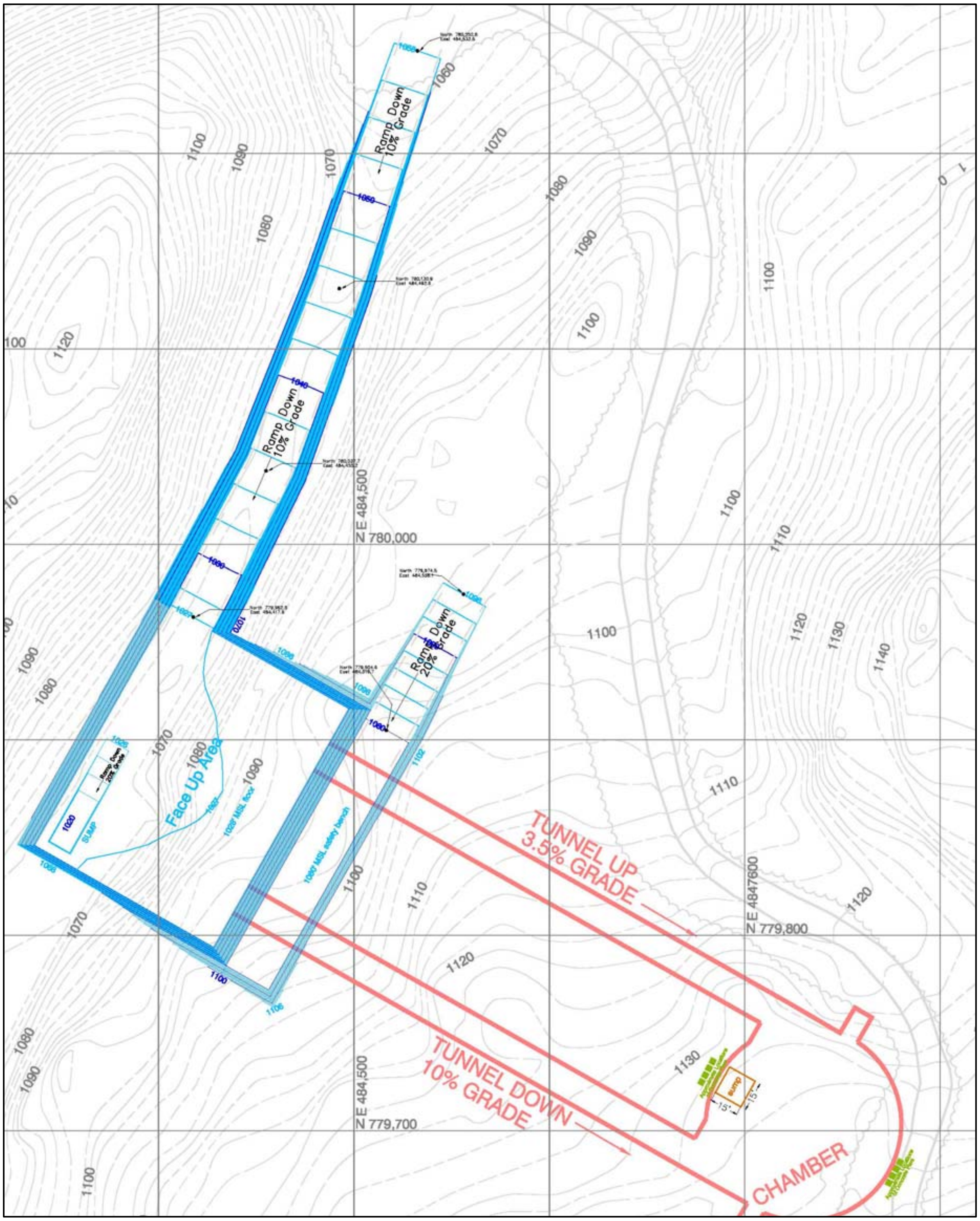

Figure 2-1. Proposed Ramp, Faceup Area, and Test Chamber Location, as adapted from the Hydrogeolgic Study for the SAFER (CPI, 2012a)

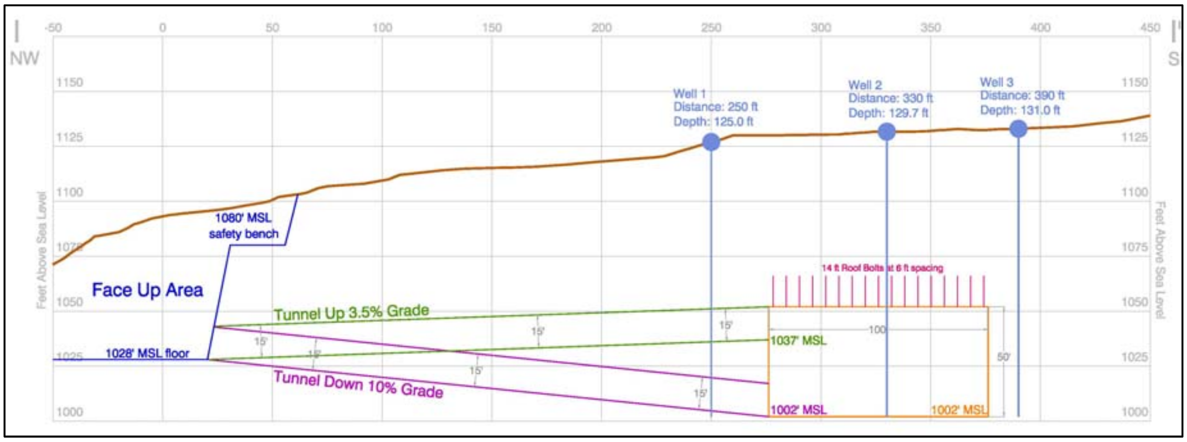

Figure 2-2. Cross-Section View of the Proposed SAFER, as adapted from the Hydrogeologic Study for the SAFER (CPI, 2012a)

Rock Feasibility Study

Prior to excavation and construction of the chamber and adits, ARDEC will perform a final horizontal rock feasibility study to confirm site stability. The rock feasibility study will be conducted in two phases.

- Phase I requires the removal of approximately seven acres of vegetation in total within the area of the proposed SAFER and rock storage areas (Area A and Area B) to allow access for heavy equipment to conduct borehole drilling, rock cutting, and some grading. The purpose of this study will be to confirm the horizontal stress field of the rock at the planned SAFER entrance ramp would support the SAFER access tunnels and test chamber. This study will further verify rock structural safety requirements for continued use of the facility.
- Phase II will allow ARDEC to locate the most favorable rock joint spacing.[6] The structural integrity of the rock will help establish bolt spacing requirements for how best to secure the chamber ceiling, I-beam (support structure) locations. Rock samples will be sent to a certified lab for fracturing and compression testing.

To accomplish this study, some explosives detonation at the SAFER site will be necessary. ARDEC will use the explosive ammonium nitrate-fuel oil (ANFO), a blasting agent that is regularly used in mining and quarrying operations. ANFO will be transported to the excavation site while strictly adhering to U.S. Department of Transportation (DOT) regulations, DA PAM 700-16, *Army Ammunition Management System* (U.S. Army, 1982), and DA PAM 385-64 for packaging and shipping.[7] A minimum amount of ANFO will be used for this study, whereas a

[6] Joint spacing between rock layers is an important factor in determining how much stress the rock can be exposed to before the rock fractures and becomes unstable.

[7] The chemical mixture that makes up ANFO is stable and may be easily handled by a commercial certified user. The mixture is used in a steel tube confinement, and inserted into pre-drilled holes and detonated to remove rock (CPI, 2009a).

greater amount of ANFO would be used for SAFER excavation, if the feasibility study yields favorable results.

ARDEC will also conduct testing to determine expected quantities of residual explosives that may remain on the debris rock surface. Depending on the results, ARDEC may need to conduct additional modeling and may work with the regulatory community to consider additional mitigation measures to minimize these potential effects. Supplemental NEPA documentation may be required.

Hydrogeologic Study

Initial geologic testing enabled ARDEC to select a preferred SAFER location in the Gorge Test Area and to conduct limited groundwater modeling. A hydrogeologic study was subsequently conducted in 2012 (CPI, 2012b) to expand on the characterization of hydraulic conditions below the soil surface. Initial borehole sites suggested the potential for groundwater to be present in the construction zone. Four monitoring wells were drilled, and pumping/slug tests were conducted to evaluate permeability of the bedrock beneath the proposed SAFER site. The 2012 groundwater study showed that excess water may be present in the subsurface during construction and operations.

As a result, the EA includes preparation and implementation of a dewatering plan as a mitigation measure for water resources potentially impacted by construction and operation of the SAFER. A groundwater flow model was developed to simulate groundwater flow in the bedrock and quantify drainage into the SAFER chamber, faceup area, and adits. A variety of hydraulic control options for stormwater and groundwater were evaluated for use during facility construction and/or operations. The study recommended a combination of controls including stormwater runoff and infiltration controls, sumps, and grouting. In addition, a water treatment option was evaluated for use in the event that water cannot be prevented from entering the chamber. Results of the hydrogeologic study will be provided to a dewatering contractor to prepare a complete dewatering plan when the NEPA analysis is complete.

SAFER Construction

Construction equipment and vehicles would enter the installation at the Phipps Road access point, which is the installation's primary entrance for commercial vehicle traffic. After entering the installation, the construction equipment would travel Phipps Road to Farley Avenue to Reilly Road to access the roads within the range complex and Gorge Test Area to reach the SAFER construction site located along Copperas Ridge Road. The primary range road leading to the construction location is paved only to a mid-point. The remainder of the road is a graded and maintained gravel road and follows along a portion of Green Pond Brook, which is a Category One[8] stream, and a wetlands area. Figure 2-3 provides a map of the proposed SAFER location, and its relation to the paved and unpaved road segments. ARDEC would minimize sedimentation and run-off to the stream and wetlands area by keeping heavy equipment at the construction site until the work is complete. Construction workers using personal vehicles would still travel on

[8] Category One waters are defined in the existing Surface Water Quality Standards rules at N.J.A.C. 7:9B-1.4 as waters protected from any measurable changes in water quality because of their exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resources (NJDEP, 2012c).

and off the installation daily. A greater discussion of construction vehicle and equipment type is found in Section 3.3. Mitigation measures are recommended in the environmental consequences subsection of Sections of 3.6, 3.7, and 3.9.

ARDEC has considered paving the unpaved road segment to the SAFER chamber as part of this project; however, the paving of the road is not required for a complete and usable facility. The estimated linear distance to be paved is approximately 0.75 mile, beginning from where the pavement ends currently and extending to the proposed SAFER facility site (Figure 2-3). ARDEC would follow standard, commercial paving materials and best practices. Paving would reduce the installation's long-term road maintenance requirements and improve the transportation conditions for munitions to be moved to the proposed SAFER for R&D. The unpaved road is currently graded and maintained.

Activities would occur at three sites, including the SAFER location and two excavated rock storage areas (Area A and Area B, shown in Figure 2-3). These sites would need to be cleared of trees, accounting for approximately 7 acres in total of cleared land. Tree clearing is inclusive of the acreage to be cleared to conduct the rock feasibility study. Tree clearing would occur in accordance with the installation's Integrated Natural Resources Management Plan (INRMP). Trees at the installation are normally cleared 16 November to 31 March (Picatinny Arsenal, 2001).

The explosive to be used during construction would be ANFO, which hydrolyzes upon contact with water. The nitrate would dissolve and proceed as nitrate upon contact with water; however, the ammonium portion of the molecule would speciate, producing all aqueous and gaseous species associated with ammonia (e.g., ammonium ion, ammonium hydroxide, ammonia [aq], ammonia [gas]), consistent with the prevailing pH and Eh (also known as oxidation-reduction potential [ORP]) of the surrounding aqueous environment. A certified contractor would transport ANFO to the approved site and begin blasting/excavation activities. An adequate-sized underground facility would require the removal of approximately 82,000 cubic yards (yd^3) of rock. The waste rock would be removed from the construction area and taken to a set of nearby rock storage areas approximately one quarter mile distant, but still within the Gorge. Figure 2-3 shows the proposed rock storage areas (Area A and Area B) in relation to the proposed SAFER site. For planning purposes, ARDEC would use dump trucks with a 30-ton capacity, roughly equal to 14 yd^3, and one loader with a 6 yd^3 carrying capacity to move rock from the excavation site to the dump sites. The Traffic and Transportation subsection of Section 3.3 provides a detailed estimate on truck trips within the Gorge Test Area, which provides a basis of estimate for air quality impact calculations.

The locations of Rock Storage Area A (located west of Copperas Ridge Road, as depicted in Figure 2-3) were specifically selected for their natural perimeter topographical features (i.e., bowl shape). This shape provides a natural containment to control stormwater runoff from the rock storage piles. Rock Storage Area B would follow a down-gradient slope to the east of Copperas Ridge Rd.

When the SAFER cave is fully excavated, additional equipment and skilled workers would be transported to the site to emplace a geo-liner beneath the floor of the SAFER main test chamber, pour and mold concrete, and install operating equipment and blast doors.

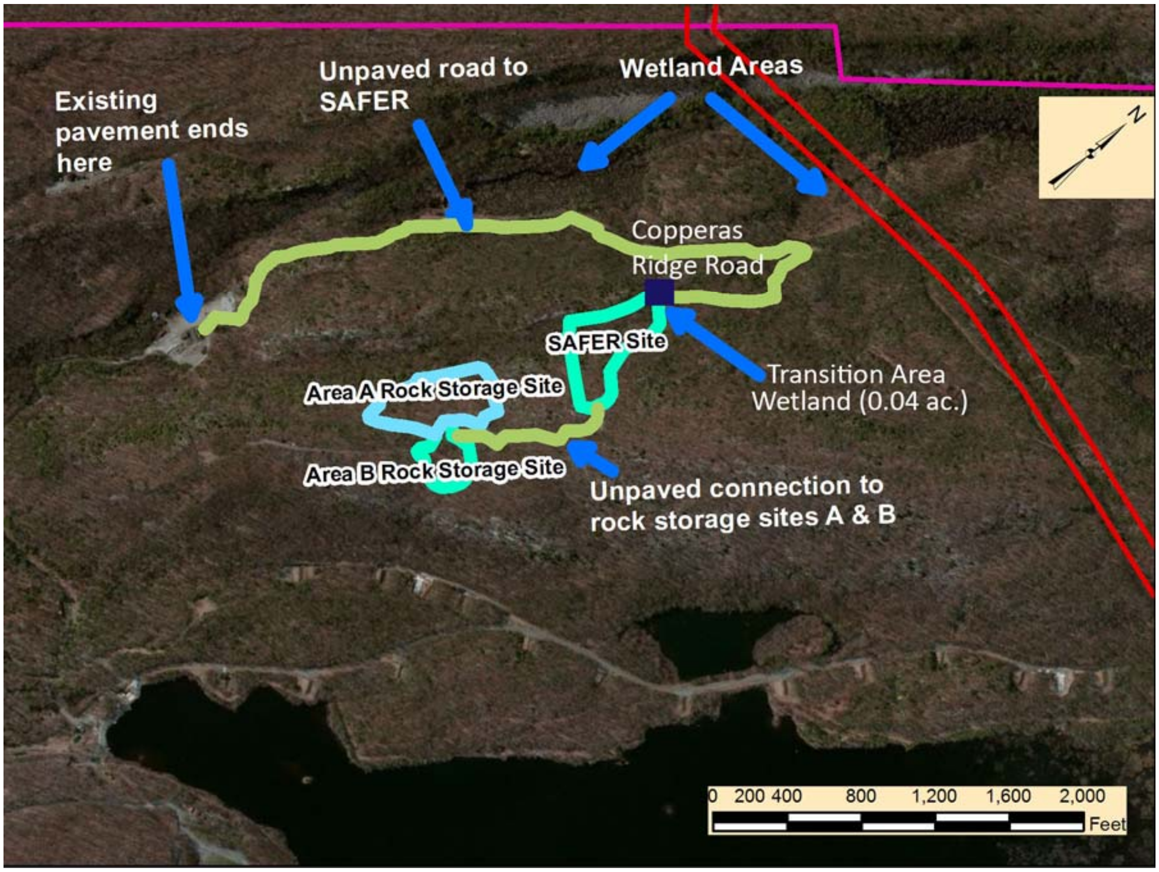

Figure 2-3. Map of Proposed SAFER and Rock Storage Areas

2.3.3.2 No Action Alternative

Under the No Action Alternative, ARDEC would not take any action to construct, operate, or maintain any facility on Picatinny Arsenal to support underground explosive or IM research and development (R&D). The R&D mission would not be supported at Picatinny Arsenal.

The No Action Alternative would require ARDEC to continue to accomplish the R&D mission at other Army installations (e.g., Aberdeen Proving Ground, Maryland, or Yuma Proving Ground, Arizona) or at offsite commercial facilities (e.g., National Technical Services Corporation, Camden, Arkansas).

This alternative would require the continued transport of experimental explosives, munitions, and other materials by truck from Picatinny Arsenal, as well as the travel of ARDEC R&D personnel, to the designated Army or commercial locations. This transport and travel requirement would have significant impact on the R&D schedule and costs, and would significantly impact the timely development and fielding of IM to forward operating areas for Soldiers to use.

Based on the priority assigned to transporting the explosive item, it can take between one to four weeks to schedule and begin the shipment. Coordination with, travel to and from, and conducting the experiments at an offsite services provider would require considerable staff time and expense. Army installations would also require cost reimbursement for their support of these experiments, and the private contractor would charge negotiated costs. These impacts would compromise ARDEC's ability to fulfill its mission.

The No Action Alternative would not be a viable means for meeting ARDEC's current and future explosive and IM R&D mission requirements. ARDEC could not fully or efficiently accomplish its mission, which includes explosive and IM R&D, in support of the Department of Defense (DoD) and its Services. The No Action Alternative also does not satisfy the screening criteria established for this project. If the No Action Alternative were implemented, ARDEC would be unable to efficiently accomplish its mission.

3.0 AFFECTED ENVIRONMENT AND CONSEQUENCES

3.1 Introduction

This EA presents a site-specific analysis of the Proposed Action to build and operate a SAFER at Picatinny Arsenal, New Jersey. The EA provides the regulatory agencies, and the public with information on the potential environmental and socioeconomic effects resulting from implementing the Proposed Action. This information will allow the decision maker to review alternatives with their potential environmental and socioeconomic impacts, and enables him/her to make an informed final decision on whether to implement the Proposed Action.

3.1.1 *Significance of Effects*

40 CFR 1508.27, *CEQ - Regulations for Implementing NEPA,* specifies that, in determining the significance of effects, consideration must be given to both "context" and "intensity."

- ***Context*** refers to the significance of an effect to society as a whole (human and national), to an affected region, to affected interests, or to just the locality.
- ***Intensity*** refers to the magnitude or severity of the effect, whether it is beneficial or adverse.

This document focuses on the construction and operation of the SAFER at Picatinny Arsenal, New Jersey, and the region that these activities could influence. The region of influence (ROI) is a geographic area selected as a basis on which social and economic impacts of project alternatives are analyzed. The criteria used to determine the ROI for resources analyzed are the geographic location of the installation, the testing area where the Proposed Action would occur, the residency distribution of the civilian population within reasonable distance of the Proposed Action, and the location of businesses providing goods and services toward the construction of the proposed facility.

The ROI may be different for each resource area analyzed. The ROI for each resource area is identified in Table 3-1, and is defined in greater detail in the sections of this document relevant to each resource area.

The ***significance*** (or severity) of potential direct, indirect, and cumulative effects is determined by evaluating the action, alternatives, and mitigation measures as they relate to each individual resource area. The evaluation of significance is typically based on the assumption that the full effect of the proposed condition would occur all at once to illustrate a "worst case scenario." In actuality, the actions evaluated in this analysis would occur incrementally; therefore, the effects would be less than the maximum predicted.

Legal requirements should be considered in determining significance. Actions that are likely to result in violation of regulatory standards are usually considered to have significant effects. Table 3-1 outlines the criteria for significance employed in this EA.

Table 3-1. Significant Effects Thresholds

Resource Area	Region of Influence	Factors
Land Use & Utilities	Picatinny Arsenal and immediate surrounding area	To the extent that surrounding land uses are expected to substantially change in a short- and long-term basis, and that the action would not be consistent with surrounding land use, severe or significant impacts are expected.
Traffic & Transportation	Picatinny Arsenal and immediate surrounding area	Whether the action permanently increases the volume of traffic on installation roadways or public roads adjacent or leading to the installation such that it degrades the Level of Service (LOS) on those roadways. Activities that would not permanently alter or notably degrade existing LOS would be considered a minor to moderate impact.
Noise & Vibration	Picatinny Arsenal and immediate surrounding area	The degree to which the noise associated with an action affects public health or safety. Activities that would not result in a notable change over the existing noise level or exceed a 65 A-weighted decibel day night average would be considered a minor to moderate impact.
Air Quality	Morris County, NJ	The degree to which the action affects attainment and maintenance of State and/or Federal air quality standards. Activities that do not exceed regulatory thresholds, but that result in a measurable change, would be considered minor to moderate impacts.
Geology & Soils	Picatinny Arsenal	The degree to which the action causes erosion resulting in soil loss, compaction that precludes establishment of native vegetation, or sediment delivery. Activities that would not result in uncontrolled erosion and adhere to Federal, State, and local Best Management Practices (BMPs) would be considered minor impacts.
Water Resources Surface Water, Groundwater	Watersheds	The degree to which the action increases sedimentation in waterways, degrades surface water or groundwater quality, or alters the floodplain. Activities would be considered a minor to moderate impact if they would not result in uncontrolled erosion/sedimentation and adhere to Federal, State, and local BMPs; result in notable floodplain alteration or changing flood elevations or flows; or cause violation of the Clean Water Act.
Wetlands	Jurisdictional wetlands within Picatinny Arsenal	The degree to which the action affects the functions and values of wetlands or whether the action violates Federal or State discharge permits. Activities that do not result in substantial wetland losses of regionally unique or rare wetlands and where suitable mitigation measures for wetland losses is available would be considered a minor to moderate impact.

Resource Area	Region of Influence	Factors
Biological Resources Wildlife, Threatened and Endangered Species and Other Species of Concern, Vegetation	Picatinny Arsenal and immediate surrounding area	The degree to which the action affects fragmentation, loss, or degradation of high quality natural areas or sensitive sites; local extirpation of rare or sensitive plant species; or the introduction or extreme increased prevalence of undesirable non-native species would cause a significant impact. The degree to which the action causes population-level impacts (e.g., potential to reduce local populations below self-sustaining levels) or long-term loss or impairment of substantial portions of local habitat would cause a significant impact. The degree to which the action has impacts on species or habitats protected under the Endangered Species Act, Migratory Bird Treaty Act, or Bald and Golden Eagle Protection Act would cause a significant impact. Activities that do not violate regulatory conditions and do not substantially alter the local biological conditions or result in regional impacts would be considered a minor to moderate impact.
Cultural Resources	Picatinny Arsenal, to include the Area of Potential Effect	An impact that alters or has the potential to alter the historic characteristics or setting of an National Register of Historic Places (NRHP) historic property, but does not diminish its integrity. This equates to no adverse effect for Section 106 under the NHPA. An impact that diminishes or destroys the integrity of an NRHP historic property. This equates to an adverse effect for Section 106 under the NHPA.
Hazardous Waste & Hazardous Materials	Gorge Test Area	The degree to which the Proposed Action increases risks to human health and safety resulting from encountering hazardous waste or handling, storage, and disposal of hazardous materials; or whether the action creates conditions leading to a Notice of Violation of laws pertaining to the generation, use, or disposal of hazardous and/or toxic materials or wastes. Activities that would adhere to Federal, State, and local hazardous material handling requirements and would not result in the uncontrolled generation of hazardous waste would be considered a minor to moderate impact. To the extent that the water quality of the underlying aquifer is potentially measurably contaminated by the proposed action, severe or significant impacts are anticipated.
Socioeconomics & Environmental Justice	Picatinny Arsenal and immediate surrounding area	The degree to which the action affects levels of employment, use of existing infrastructure, or family income; disproportionate impacts to minorities or low-income individuals; or causes health and safety risks for children. Activities that do not notably alter levels of employment, or disproportionately impact minorities or low-income individuals, or result in health and safety risks for children would be considered a minor impact.

Resource Area	Region of Influence	Factors
Human Health & Safety	SAFER Site Location	The degree to which the action may increase risks to human health and safety, including physical injuries, psychological effects, and the potential of exposure to hazardous substances and unsafe structures. Activities that do not exceed established Federal, State, and local health and safety laws and regulations would be considered minor to moderate impact.
Cumulative Impacts	**Varies by resource area**	**Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.**

3.1.2 *Summary of Environmental Effects*

Table 3-2 presents the basic, qualitative definitions of the degrees of environmental impact that have informed this analysis. Table 3-2 describes the significant effects thresholds on a resource-by-resource basis. Together, these tables fully describe the link between the Proposed Action and its environmental effect for the purposes of this document.

Table 3-2. Summary of Environmental Consequences

Beneficial	Only Beneficial Impacts Are Anticipated
Insignificant	
No Impact	No measureable impacts are anticipated
Minor	Adverse impacts are anticipated that would be measureable and may have a slight effect on the resource
Moderate	Adverse impacts are anticipated that would be noticeable and would have a measureable effect on the resource; mitigations may be recommended to reduce adverse effects
Significant	
Significant	Adverse impacts are anticipated that would be obvious and would have serious consequences on the resource; mitigations would be required to reduce effects to insignificant, if possible

Table 3-3 is a summary matrix of the two alternatives (the Proposed Action and the No Action Alternative) and their aggregate direct and indirect environmental impact ratings for each resource area analyzed, with intended mitigation actions factored into the assessment of the impact. The aggregate impact ratings presented below were determined by reviewing the impact ratings for each activity area (construction and operation) and applying a simple worst-case scenario methodology, where the highest impact rating was taken to represent the resource area as a whole. It was determined that a more complex averaging or weighting scheme would not provide additional key information for the decision maker to consider.

Table 3-3. Summary of Direct/Indirect Consequences to Evaluated Resource Areas

Resource Area	Preferred Alternative	No Action Alternative
Land Use & Utilities	Short-term, indirect, minor adverse impacts during construction	No Impact
Traffic & Transportation	Short-term, minor increase in traffic volume on a relatively limited number of days during construction	No Impact
Noise & Vibration	Short-term, minor noise and vibration impacts during construction; however, noise and vibration impacts are anticipated to decrease during operation of the SAFER	No Impact
Air Quality	Temporary, direct, minor adverse impact on the local airshed during construction	Long-term, minor, indirect impacts on regional air quality from the increased use of fossil fuels used to transport materials and associated greenhouse gas (GHG) emissions
Geology & Soils	Short-term, direct, minor adverse impacts to the soil during construction with Mitigations to decrease sedimentation	No Impact
Water Resources	Short-term, direct, moderate adverse impacts to groundwater and surface water with Mitigations	No Impact
Wetlands	Long-term, indirect moderate adverse impacts to the wetland transition area	No Impact
Biological Resources	Short-term, direct, moderate adverse impacts with Mitigations	No Impact
Cultural Resources	No impact	No Impact
Hazardous Waste & Hazardous Materials	Long-term, direct, minor adverse impact	No Impact
Socioeconomics & Environmental Justice	Short-term, beneficial, direct impact	No Impact
Human Health & Safety	Short-term, direct, minor adverse impacts; however, beneficial impact to safety, as it would eliminate the need for open air detonation and the transportation of experimental munitions on public roadways	Adverse impacts due to the need to transport experimental munitions to other facilities

3.2 Land Use & Utilities

The ROI for land uses consists of Picatinny Arsenal and the land immediately adjacent to the Arsenal, including recreational areas or park land directly or indirectly linked to the installation.

3.2.1 *Affected Environment – Land Use & Utilities*

Picatinny Arsenal lies west of the greater New York/New Jersey Metropolitan Area, approximately 42 miles west of New York, and 32 miles northwest of Newark, New Jersey. The Arsenal is situated in the New Jersey Highlands, running in a southwest to northeast direction along a broad valley floor. Green Pond Mountain runs roughly parallel with the Arsenal's northern boundary, and State Route 15 runs along the southern boundary of the installation. The boroughs of Dover, Rockaway, and Wharton are located within five miles of Picatinny Arsenal. The valley is drained by Green Pond Brook to the southwest of the installation. Lake Ames Park, Mt. Hope Park, and Wildcat Ridge State Wildlife Management Area lie along the Arsenal's central southeastern border. The remaining areas surrounding the installation are characterized by small towns, bedroom communities, and semi-rural areas.

Picatinny Arsenal is made up of nearly 6,500 acres, with much of the open space (unimproved grounds) between facilities reserved as explosive safety zones (Picatinny Arsenal, 2008a). The land use pattern at the Arsenal is mixed, and includes R&D, residential, institutional, industrial, cultural, and recreational uses and facilities. Land use includes improved grounds, semi-improved grounds, and unimproved ground (Picatinny Arsenal, 2008a).

The SAFER proposed location is within the Gorge Test Area, located west of 25th Avenue and northeast of Upper Gorge Road in what is known as the 1200 Area. This site is classified as an unimproved parcel of land. Construction of the SAFER within the Gorge Test Area would reduce the amount of open space on the installation by approximately 7 acres in total. Since the test facility is proposed for construction within a hillside, the footprint of the planned facility to be surfaced would minimized to only a parking area adjacent to the facility's entrance.

There are no R&D operations or personnel currently located on that portion of the Gorge Test Area. According to the Arsenal's Real Property Master Plan, there are no land use controls that limit the improvement of the proposed site (Picatinny Arsenal, 2008a), and the site is located wholly within the Arsenal's boundaries on land owned by the Federal Government in a restricted access and explosive safety area; therefore, the proposed action would not require re-classification or changes to existing land uses.

Power would be supplied to the facility by an on-site generator prior to installation of local area network (LAN) and power lines. Utilities would be installed at the proposed SAFER location following its construction, when the Upper Gorge Road leading up to the SAFER location is planned to be paved. Communication would be facilitated by handheld radios.

3.2.2 *Environmental Consequences – Land Use & Utilities*

No Action Alternative

Implementing the No Action Alternative would result in no changes to the current land use during the construction and operations phases.

Preferred Alternative

Construction. (Minor Impact) Implementing the Preferred Alternative would result in short-term indirect minor impacts during the construction phase as no major changes in land use activities are anticipated.

Operations. (Minor Impact) Implementing the Preferred Alternative would have no direct impacts and only minor, indirect impacts on land use once the SAFER is constructed. An electric line would be installed to service the SAFER operations. The line would be constructed underneath the currently unpaved Upper Gorge Roadway and a portion of Copperas Ridge Road, tying into an existing electric line located underneath the paved section of Upper Gorge Roadway. The unpaved portion of Upper Gorge Roadway and a portion of Copperas Ridge Road leading to the SAFER would be paved as part of this project.

The proposed facility location is positioned within a restricted access and explosives safety area and is currently permitted for explosive R&D. The proposed location is surrounded on all sides by forest, and its land use would be consistent with historical land use for that area.

3.3 Traffic & Transportation

3.3.1 *Affected Environment – Traffic & Transportation*

The ROI for traffic and transportation consists of Picatinny Arsenal and public roadways immediately adjacent and leading to the installation. The elements of traffic and transportation considered in this analysis are the movement of heavy construction equipment to and from the site, commuting of the construction workforce, and movement of excavated soil and rock from the construction site.

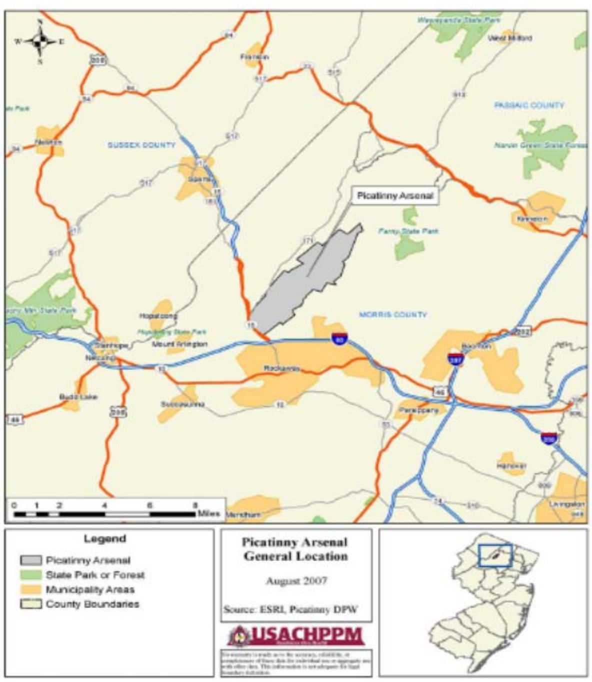

Figure 3-1. Picatinny Arsenal and Surrounding Road Network

Picatinny is situated in proximity to three Interstate highway corridors. Interstate 80 (I-80), which passes just south of the installation, is the major east-west route connecting the New York City area with Cleveland, Ohio, and points west. To the south, I-78 connects Newark, New Jersey, and Allentown, Pennsylvania. Interstate 287 passes east of Picatinny, providing a bypass of New York City, while connecting to I-87, I-80, I-78, and the New Jersey Turnpike (see Figure 3-1).

State Route 15 is the primary access to Picatinny, from both I-80 (to the south) and points north. Route 15 is a four-lane major arterial roadway with access restricted to grade-separated interchanges and signalized intersections at major cross-streets. The two major access points to the regional road network are the Picatinny main gate on Parker Road and the installation's commercial truck gate on Phipps Road, both of which lead directly to Route 15.

A traffic study conducted for Picatinny Arsenal determined traffic congestion on southbound Route 15 during the morning peak is LOS E and is also LOS E northbound during the afternoon peak. LOS during non-peak hours was determined to range from LOS B to LOS D (Clough, Harbour and Associates, 2007).

The road network on Picatinny Arsenal serves administrative, commercial, residential, and industrial areas, and provides connections to the local off-post transportation network. Picatinny has approximately 84 miles of roads. Roads are classified as either primary or secondary, according to their relative importance and function as part of the roadway network.

- Primary roads include all roads and streets that serve as main distribution arteries for traffic originating outside and within the installation and that provide access to, through, and between functional areas.[9]
- Secondary roads supplement primary roads by providing access to, between, and within functional areas.

The major arterials roadways near Picatinny (I-80 and NJ Route 15) routinely experience high levels of congestion during the morning (eastbound I-80, southbound NJ Route 15) and evening (westbound I-80 and northbound Route 15) peak hours (Picatinny Arsenal, 2008a).

The installation has a workforce of approximately 3,950 (Picatinny Arsenal, 2008a). Installation employees primarily enter Picatinny Arsenal through the Parker Road Gate, located on U.S. Route 15, and travel into the cantonment area on Parker Road. Commercial vehicles, including construction equipment, enter the installation through the Phipps Road Gate. Phipps Gate is also on U.S. Route 15, located 0.6 miles northwest of the Parker Road Gate. The commercial vehicle route on the installation is also often used by installation employees accessing the installation.

The construction contractor requires heavy equipment for the proposed project. Table 3-4 provides a list of the construction equipment necessary at the SAFER construction site.

Table 3-4. Construction Equipment Required

Equipment	Description	No.	Type	Engine	Model	Brake HP
Water truck	Mack	1	Diesel		EM6-275L	275
Skid Steer	Komatsu WA180-3ML	1	Diesel		S6D102E-1	128
Loader	Cat 980 H	1	Diesel	Cat	3166	220
Grader	Cat Grader	1	Diesel	Cat	3306	200
Haul truck	Mack	1	Diesel	Mack	MP7395C	395
Pressure washer	Genie	1	Diesel		F4L1011F	50
Drill Jumbo	Fletcher 1 boom	1	Diesel	Cat c7	Tier III	250
Roof Bolter	Fletcher	1	Diesel	Cat C7	Tier III	250
ANFO Loader	Oldenburg (2) 2500 lb pots	1	Diesel	Cummins	QSB4.5 Tier III	160
Pickup truck	F250 crew cab	2	Diesel	Ford	6.7 L	300
Air Compressor	Atlas Copco	1	Diesel	Cat C12	3406	400

[9] Functional areas may be defined as either the urban or suburban areas of a municipality, or within the cantonment area of an installation where the day-to-day businesses of managing installation responsibilities or mission activities occur.

Equipment	Description	No.	Type	Engine	Model	Brake HP
Beetle drill		1	Diesel	Cummins	4B	90
Bulldozer	Caterpillar	1	Diesel	Cummins	D7	240

Most of this equipment would move onto the site and remain there for the duration of the project. Construction equipment required for the project would enter the installation at the Phipps Road access point. This is the installation's primary entrance for commercial vehicle traffic. After entering the installation, the construction equipment would travel Phipps Road to Farley Avenue to Reilly Road to access the roads within the range complex to the SAFER construction site. Construction vehicles would follow the same route to leave the installation when the work is complete. Of the construction equipment, the water truck, haul truck and pickup trucks would be driven to the site. All other equipment listed in Table 3-4 would be carried to the site on another vehicle, such as a low-bed trailer. All of the equipment would remain on site for the duration of the construction period.

It is estimated the water truck and haul truck would each make a daily round trip from the construction site to the installation cantonment area. The water truck would be used to moisten the road surface to keep excess sedimentation from entering Green Pond Brook. The haul truck may travel off the installation to pick up other equipment or supplies necessary for the construction project. The two pickups may make as many as two round trips per day. The bulldozer would operate at the deposit site, and remain there for as long as soil and rock are transported to that site.

Construction would require a crew of between 10 and 15 personnel, and up to that many personally occupied vehicles (POVs) on any given day. Construction would generate a minor increase of truck traffic to the installation over a six month period. This increase in traffic would include commercial vehicles delivering material, such as concrete, to support project construction. This would involve up to three to four commercial vehicles per week, delivering equipment and construction materials necessary for the SAFER construction project.

In addition, the concrete required for the project would require approximately 75 trips by concrete trucks over a period of two weeks. This amounts to approximately an average of approximately eight trips by concrete trucks per day for two weeks.

The construction contractor indicated that an estimated 82,000 cubic yards of rock would be removed from the construction site to host the SAFER (CPI, 2009b). For planning purposes, the excavated rock has a relatively high unit density associated with granite or equivalent, ranging from 145 pounds per cubic foot (lb/ft^3) to 165 lb/ft^3. For planning purposes this analysis assumes the excavated rock has a density of 155 lb/yd^3, which equals 4,185 pounds per cubic yard (lb/yd^3). A 30-ton capacity dump truck (e.g., a Caterpillar model D300 or equivalent) can carry 14.3 cubic yards of rock (60,000 lb / 4,185 lb/yd^3 = 14.3 yd^3).

This analysis also assumes the excavated rock has large aggregate, ranging from 6-inch to 18-inch diameter or larger. Large diameter aggregate would have larger void space than soil or gravel, reducing the effective capacity of each truck to approximately 14 yd^3 per trip. Moving 82,000 yd^3 of rock at 14 yd^3 per truck load would require approximately 5858 trips.

This analysis also assumes an experienced operator of a 6 yd^3 loader can load a 30-ton dump truck in approximately 5 to 7 minutes. For a round trip distance of approximately 0.50 mile between the construction and deposit sites, one truck could make the round trip in approximately 30 minutes. Under those assumptions, the operation would operate at optimum efficiency with six, 30-ton capacity trucks. For a load-deposit distance of approximately 0.25 mile, any additional trucks would create backups at both the load and deposit sites. Assuming each truck can make the round trip between the construction site and deposit site in 30 minutes, six trucks can make a total of 96 trips in an 8-hour work day. At that production rate, it would take approximately 61 days to move 82,000 cubic yards of rock.

If the project does not consistently generate 1344 yd^3 of rock per day (14.0 yd^3/truck x 96 truck/day), the movement of rock would take more than 61 days, but would still generate approximately 5848 total truck trips.

The project construction site and the sites for depositing the rock are approximately 0.25 miles apart and both are within the installation's range complex (see Figure 2-3). Use of roadways within the range complex is limited to those personnel with official business within the range complex. Access to this area is controlled at a security gate located on Reilly Road. Traffic on these roadways is very sparse.

3.3.2 *Environmental Consequences – Traffic & Transportation*

No Action Alternative

Implementing the No Action Alternative would result in no changes to the current traffic and transportation systems during the construction and operations phases.

Preferred Alternative

Construction. (Minor Impact) Construction activities are expected to generate a minor, short-term increase in traffic volume on a relatively limited number of days during the construction period. This level of traffic volume increase would have only a minor, if even measurable, impact on traffic leading to Picatinny Arsenal, or on traffic on the installation. Further, the Preferred Alternative would be a beneficial impact in that Picatinny no longer has to transport munitions to other installations' test sites.

Concrete required for the project would require approximately 75 trips by concrete trucks to the SAFER construction site. Distributed over a period of two weeks, concrete trucks would make an average of eight trips per day, and it is likely several trucks would be on the road during morning peak hours. This could have a minor impact on LOS on southbound NJ Route 15 during morning peak hours, and would have no impact on the level of service on northbound NJ Route 15. To minimize any impact on LOS on NJ Route 15 and morning peak onto the installation, delivery of concrete trucks and other construction-related activities would occur outside of peak traffic hours.

Construction-related vehicles could have a minor short-term impact on traffic congestion, particularly NJ Route 15. These impacts can be minimized by scheduling construction-related truck traffic to arrive on site after the morning peak traffic period.

It is not likely that construction and operations of the SAFER would impact traffic congestion on or near the installation. The volume of traffic from the construction workforce would be an insignificant addition to the regular volume of traffic from the installation's workforce. Additionally, this traffic would be temporary in nature, lasting approximately six months; therefore, long-term impacts are not expected.

Movement of heavy construction vehicles onto and off the installation would have no effect on human health and the environment, and would have minimal impact on traffic on either public roadways leading to Picatinny Arsenal or roadways on the installation. The addition of the 10 to 15-person construction workforce to the commuting traffic for approximately 6 months on roadways leading to and on the installation would also be insignificant, and would have minimal and temporary impact on LOS on these roadways.

Rock Excavation

Movement of soil and rock from the excavation site to the deposit site is limited to trucks traveling the 0.50-mile total round trip between the SAFER project site and the deposit site. These trucks would remain on roadways within the installation's limited use Gorge Test Area. Truck traffic to move excavated rock would have no impact on traffic on the public roadways on the installation, and would pose no traffic safety risk. The trucks would not travel off the installation during the construction period, and would have no impact on traffic on public roadways off the installation.

Operations. (No Impact) Once complete, the SAFER facility is not expected to generate any increase in traffic on the installation, and there would be no direct or indirect impacts on traffic.

3.4 Noise and Vibration

This section evaluates the potential for noise and vibrations that would be generated by the proposed action to affect the public and/or sensitive wildlife receptors (Section 3.9.2) at or near Picatinny Arsenal. The region of influence for noise and vibration is the Picatinny Arsenal and immediate surrounding community within Morris County, NJ, including the Rockaway and Jefferson townships.

3.4.1 *Affected Environment – Noise and Vibration*

Military training and R&D operations often cause significant noise impacts on the surrounding area. Community annoyance response to noise, typically in the form of complaints, political pressure, legal action, and damage claims, can hamper mission execution (Picatinny Arsenal, 2007a).

To address potential current and future noise impacts, ARDEC has developed and implemented guidelines for achieving compatibility between the Arsenal and the surrounding communities. These guidelines are presented and discussed in the Arsenal's *Installation Operational Noise Management Plan (IONMP)* (Picatinny Arsenal, 2007a). The IONMP provides a framework to protect the installation and public by identifying noise-impacted areas and guidelines; the concerned public, local government, and installation elements work together to minimize noise effects and remain in compliance with AR 200-1 and New Jersey Regulations N.J.A.C 7:29 (Picatinny Arsenal, 2007a).

To determine and evaluate noise impacts, ARDEC often conducts noise studies and performs computer modeling (Picatinny Arsenal, 2007a). The U.S. Army Center for Health and Promotion and Preventative Medicine (CHPPM), now known as U.S. Army Public Health Command, conducted a noise study on Picatinny Arsenal in 2007. The study analyzed noise generated from munitions testing on the installation. The results of the noise study are discussed in the IONMP.

Currently, the ambient noise levels at Picatinny Arsenal average day-night sound level (L_{dn}) is 35 to 45 decibels (dBA) when no ordnance testing or detonation activity occurs. In areas subjected to heavy vehicular traffic, ambient noise levels may reach as high as 55 L_{dn}. In areas near detonation and testing sources, 131.8 dB is the peak sound level that has been recorded, based on available ARDEC data. Table 3-5 presents common sound levels for reference.

Table 3-5. Sound Levels of Various Sources

Source	Sound Level (dB)
Noise Generated from Training Activities	
Rocket Noise at 500 meters	160
120mm Gun (M1 Tank) or 155mm Howitzer at 500 meters	141 – 143
M34 Hostile Fire cartridge at 20 meters	135
M35 Target Hit cartridge at 20 meters	120
M-2 Machine Gun (.50 Caliber) at 500 meters	74 – 92
M-16 Rifle (5.56 Caliber) at 500 meters	65 – 83
Comparable Noise Levels Easily Identified by Civilians	
Shotgun discharge at 0 meters	170
Near jet plane at takeoff	140
Loud music	115
Thunder	110
Motorcycle	100
Lawn mower at 15 meters	90
Normal conversation	60
Threshold of hearing for humans	0

**Sources: USEPA, 1974; CHPPM, 2005*

The IONMP indicates that primary source of noise on Picatinny Arsenal is generated through large caliber weapons testing and explosive detonation activities. The three dominant sources of existing noise at Picatinny Arsenal are the Large Caliber Ballistic Test Area at Building 636, open detonation in the Gorge at Building 1222, and the Rail Gun facility at Building 3620 (Picatinny Arsenal, 2007a).

Note that, because there are multiple testing activities occurring at any given time on Picatinny Arsenal, all of which can generate substantial noise, the sum of these activities has been evaluated in the IONMP. This sum provides a "worst case scenario" for large caliber and impulsive noise on the installation.

The noise impact on the community from Arsenal activities can be translated into noise zones and recommended land use zones. The land use zones for the Arsenal are defined in Table 3-6 and depicted in Figure 3-2. Zone I is compatible with noise-sensitive uses. Zone II is normally incompatible with noise sensitive uses, and Zone III is incompatible with noise sensitive uses.

Table 3-6. Noise Zones for the Arsenal

Noise Zone	Noise Limits (dB)	Noise Limits (dB)	Noise Limits (dB)
	A-weighted Day-Night Levels (ADNL)	Impulsive C-weighted Day-Night Levels (CDNL)[10]	Small Arms PK15 – Single Event Peak Level
Land Use Planning Zone	60-65	57-62	N/A
I	<65	<62	<87
II	65-75	62-70	87-104
III	>75	>70	>104

The IONMP and Figure 3-2 indicate that that the CDNLs for Zones II and III are for the combined operations, completely contained within the installation boundary, and compatible with Federal guidelines. Note that the former IM testing related to the proposed action once occurred within Zone III, as shown on Figure 3-2.

3.4.1.1 Noise Levels Associated with the Construction of the SAFER

Noise associated with the building of the SAFER would include noises typically generated at construction sites (e.g., heavy trucks, bull dozers, jack hammers). In addition, rock blasting would be necessary to remove and construct the chamber. A total of 85 days of blasting are anticipated; of the 85 days, 45 days of underground blasting would occur (CPI, 2012c). As noise impacts typically decrease with distance, noise from the blasts would lessen over time as construction continues deeper into the underground tunnel and chamber.

Approximately 1,000 pounds of ANFO would be used on days when blasting occurs. The ANFO would be inserted into holes deep enough to suppress the bulk of the blast noise. In addition, the blasts would not all happen at once; for example, there may be 10-20 smaller blasts per day using 50 lbs of ANFO. This would result in several brief successive or consecutive blasts that would be much less audible than if 1,000 pounds of ANFO were to be blown at once.

Maximum sound levels of 85-95 dBA are anticipated for heavy equipment to be used during construction (Sotelo, 2009). On an unweighted scale, heavy construction equipment may generate sound levels up to 107 dB (3D/Environmental, 1996). Blasting studies from mining and construction operations indicate that aboveground blasting may generate sound levels up to 110 dB (Siskind, 2000), which would be consistent with the IONMP. Underground blasting would generate considerably lower sound levels than aboveground blasting.

[10] The C-weighted scale is the scale most commonly used to measure blasting and low frequency sounds.

The impact of blasting to homeowners is expected to be comparable to the equivalent of putting in sewer lines. The nearest off-site homeowner is assumed to be approximately one mile away from the proposed SAFER site. The blasting would adhere to industry standards.

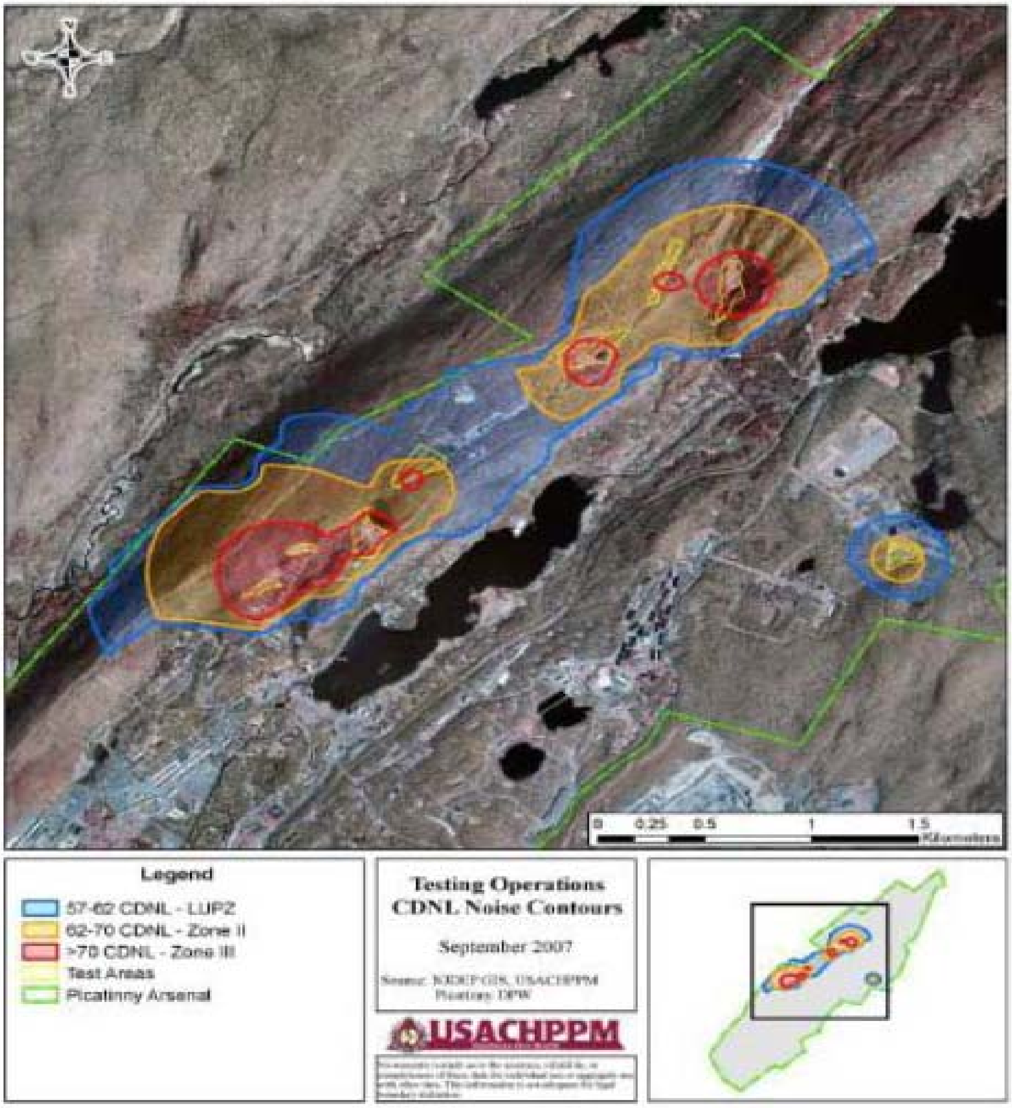

Figure 3-2. Noise Zones for Testing Operations at Picatinny Arsenal
Source: Picatinny Arsenal, September 2007a

3.4.1.2 Vibration Impacts Associated with the Construction of the SAFER

Blasting during the construction phase of the project may generate vibration waves. Specifically, when explosive charges detonate rock, a small amount of the energy is released in vibration waves that radiate from the blast charge in all directions. The characteristics of the vibration waves may vary slightly based on the rock properties; however, the rate at which they die out is based on the distance and the amount of explosive (Illingworth, 2003).

Vibration waves have the potential to cause structural damage. Several studies have been undertaken to determine the best way to predict the potential damage from vibration waves (Siskind et al., 1980). Studies indicate that peak particle velocity (PPV), which is the measure of the blast wave as it passes at a given location, is the best single way to estimate damage potential, and that the chance of damage from a blast generating peak particle velocities below 0.5 in/sec is minimal.

Using a mathematical equation based on the relationship between the distance from the explosion and the explosive quantities provides a reliable method to predict whether there is a potential for impacts to nearby residences from blasting operations.

Estimated PPV from the proposed aboveground blasting activities can be modeled according to the following equation (Siskind, 2000) for typical quarry production blasts:

$$PPV = 182*(D/W^{1/2})^{-1.82}$$

where:

PPV = Peak particle velocity (in/sec)
D = Distance between blast and measurement location (feet)
W = maximum charge weight per delay (lbs)

For aboveground blasting that would occur at the SAFER site, the blasting would be done in a series of boreholes and detonations using approximately 50 lbs of explosives for each blast. Thus, the typical charge weight per delay (W) would be 50 lbs (CPI, 2012d). Higher values of W (up to a maximum of 200 lbs) would occasionally be needed (CPI, 2012d). Based on a maximum value of 200 lbs for W, the PPV at a distance of 2,000 feet (conservative estimate for distance from proposed SAFER site to the nearest residence) would be 0.022 in/sec (Table 3-7).

Table 3-7. Estimated PPV for Aboveground Blasting

Charge Weight per Delay	PPV at Nearest Residence
Typical - 50 lbs	0.0063 in/sec
Maximum - 200 lbs	0.022 in/sec

The PPV for underground blasting (i.e., blasting within the tunnel or chamber) that would occur as part of the SAFER construction efforts would be less than the PPV estimated for aboveground blasting and can be modeled according to the following equation (Siskind, 2000):

$$PPV = 15.1*(D/W^{1/2})^{-1.45}$$

where:

PPV = Peak particle velocity (in/sec)
D = Distance between blast and measurement location (feet)
W = Charge weight per delay (lbs)

For underground blasting, a maximum charge weight per delay (W) of 150 lbs is anticipated (CPI, 2012d), and the maximum PPV at a distance of 2,000 feet (conservative estimate for distance from proposed SAFER site to the nearest residence) would be 0.0093 in/sec (Table 3-8).

Table 3-8. Estimated PPV for Underground Blasting

Charge Weight per Delay	PPV at Nearest Residence
Maximum - 150 lbs	0.0093 in/sec

The maximum PPV for both aboveground blasting (i.e., 0.022 in/sec) and underground blasting (i.e., 0.0093 in/sec) are well below the 0.5 in/sec PPV recommended by the U.S. Bureau of Mines for blasting (CHPPM, 2005). Note that the U.S. Bureau of Mines has also identified 2.0 in/sec PPV as the threshold level for which minor structural damage may occur in 0.01 percent of structures (CHPPM, 2005). Further, a report provided by the construction contractor conveys that crack propagation would be limited to 6 to12 feet from the boreholes, which is based on studies conducted on explosives and rock blasting (CPI, 2009c).

3.4.1.3 Noise Levels Associated With the Operation of the SAFER

Based on available ARDEC data, 131.8 dB is the peak sound level recorded for munitions testing. Anecdotal evidence suggests sound levels from munitions testing outside of the chamber would be 90 percent lower than the levels inside the chamber. These sound levels would be consistent with the IONMP.

3.4.1.4 Vibration Impacts Associated With the Operation of the SAFER

During operations, the detonations within the SAFER would result in minimal vibration waves. Because the explosive charge would be placed on a pedestal prior to detonation, the charge would not be touching the chamber walls, therefore reducing the ability to transmit waves. This "de-coupling" process, along with the air in the chamber, would remove the instantaneous shock of the coupled explosive, thereby minimizing the potential for vibration waves to impact the surrounding community.

3.4.2 *Environmental Consequences – Noise and Vibration*

No Action Alternative

Implementing the No Action Alternative would have no noise and vibration impacts.

Preferred Alternative

Construction. (Minor Impact) Implementing the Preferred Alternative would result in short-term minor noise and vibration impacts mainly due to its remote location within the installation boundaries. Construction activities would contribute to indirect increased noise levels in the vicinity due to vehicle use and construction activities (e.g., heavy machinery and explosive detonation to remove rock in the Gorge). However, these impacts would be temporary, limited to approximately six (6) months, and localized to the Gorge area. The actual construction noise from the vehicles, movement of rock, and the development of the chamber would be similar to building construction activities that typically occur in a municipality or town. Minimal sound impacts are anticipated for the off-post land and public due to the distance the sound must travel to reach the boundaries of the installation.

It is anticipated that blasting activities during construction would result in short-term minor impacts. As detailed in Section 3.4.1.2, ground vibrations of less than 0.5 in/sec PPV at the nearest residences may occur; however, these impacts would be temporary. As the construction activities advance further into the adits (tunnels) leading to the blast chamber, the actual impact of the explosions are anticipated to decrease, thereby reducing the potential impacts of noise and vibration to surrounding receptors.

Fracturing may also occur during blasting; however, it is anticipated that any fracturing resulting from construction-phase blasting would be minor and limited only to the construction site.

Operations. (Minor Impact) Once the Preferred Alternative is constructed and in operation, the detonations would occur underground and noise and vibration impacts would be minor. The SAFER would significantly reduce noise levels by decreasing the use of outdoor detonation. As stated in Section 3.4.1.3, 131.8 dB is the peak sound level recorded for munitions testing. Anecdotal evidence suggests sound levels from munitions testing outside of the chamber would be 90 percent lower than the levels inside the chamber.

Ground vibrations from detonation would also occur but would be minimal. Since detonations would occur within the chamber on a stand, the impact to the surrounding community from the detonations would be minor.

3.5 Air Quality

3.5.1 *Affected Environment – Air Quality*

The Clean Air Act (CAA), the primary Federal statute regulating air emissions, applies fully to all Army installations. The CAA categorizes regions of the United States as nonattainment areas if air quality within those areas does not meet the required ambient air quality levels set by the National Ambient Air Quality Standards (NAAQS). The National and New Jersey Ambient Air Quality Standards (NJAAQS) consist of primary and secondary standards for "criteria air pollutants:" sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), lead (Pb), and particulate matter particulates with aerodynamic diameter of 10 microns (PM_{10}) and 2.5 microns ($PM_{2.5}$). The ambient air quality in Morris County, New Jersey, meets the Federal and State standards for SO_2, CO, PM_{10}, Pb, and NO_2. Therefore, the county is designated by the U.S. Environmental Protection Agency (EPA), per 40 CFR 81, as an attainment/unclassifiable area for these five pollutants.

However, ambient air quality in the county and State-wide does not meet the National and New Jersey AAQS for O_3 and $PM_{2.5}$. EPA designated Morris County as a nonattainment area (moderate) for ozone and basic nonattainment for $PM_{2.5}$ (per 40 CFR 81). Nitrogen oxides (NO_x) and volatile organic compounds (VOCs) are precursors to ozone formation, and are regulated as nonattainment pollutants. The NAAQS and NJAAQS are provided in Tables 3-9 and 3-10, respectively. Measured ambient concentrations of the primary pollutants in the vicinity of Picatinny Arsenal are provided in Appendix A.

States have the authority to establish emission source requirements to achieve attainment of the NAAQS. These requirements may be uniform for all sources or may be specifically tailored for individual sources. Source emission requirements in State Implementation Plans (SIPs) may be established for stationary and mobile sources. Implementation of the CAA's requirements, for purposes of achieving NAAQS, is achieved primarily through SIPs and various Federal programs. The CAA requires states to develop SIPs that establish requirements for the attainment of NAAQS within their geographic areas. SIPs must identify major sources of air pollution, determine the reductions from each source necessary to attain NAAQS, establish source-specific and pollutant-specific requirements as necessary for the area, and demonstrate attainment of NAAQS by the applicable deadlines established in the CAA.

Table 3-9. National Ambient Air Quality Standards

Pollutant	Averaging Period[a]	Primary NAAQS [b]	Secondary NAAQS [b]
NO_2	1-hour	150-190 μg/m³ [c]	---
	Annual	100 μg/m³	100 μg/m³
CO	1-hour	40,000 μg/m³	---
	8-hour	10,000 μg/m³	---
SO_2	1-hour	130-260 μg/m³ [c]	---
	3-hour	---	1,300 μg/m³
	24-hour	365 μg/m³	---
	Annual	80 μg/m³	---
PM_{10}	24-hour	150 μg/m³	150 μg/m³
$PM_{2.5}$	24-hour	35 μg/m³	35 μg/m³
	Annual	15.0 μg/m³	15 μg/m³
Ozone	1-hour	0.12 ppm	0.12 ppm
	8-hour	0.075 ppm	0.075 ppm
Lead	3-month	0.15 μg/m³	0.15 μg/m³

μg/m³ – micrograms per cubic meter
mg/m³ – milligrams per cubic meter

a. All short-term (1-hr, 3-hr, 8-hr, and 24-hr) standards except ozone, $PM_{2.5}$ and PM_{10} are not to be exceeded more than once per year. For 8-hr ozone, EPA uses the average of the annual 4th highest 8-hour daily maximum concentrations from each of the last three years of air quality monitoring data to determine a violation of the standard. For 24-hour PM_{10}, EPA uses the 6th highest 24-hour maximum concentration from the last three years of air quality monitoring data to determine a violation of the standards. For 24-hour $PM_{2.5}$, EPA uses the 98% percentile 24-hour maximum concentration from the last three years of air quality monitoring data to determine a violation of the standard. For the proposed 1-hour NO_2 and1-hour SO_2 NAAQS, compliance would be determined using the 3-year average of the 4th daily high of hourly averages for each year. 3-month and annual standards are never to be exceeded.
b. The actual form of each standard is listed first. The values in parentheses are approximations provided for convenience.
c. Standards proposed by EPA.

Table 3-10. New Jersey Ambient Air Quality Standards Pollutant

Pollutant	Averaging Period[a]	Primary NJAAQS[b]	Secondary NJAAQS[b]
NO_2	12-Month	100 µg/m³	100 µg/m³
	1-hr [c]	470 µg/m³	---
CO	1-hour	40 mg/m³	40 mg/m³
	8-hour	10 mg/m³	10 mg/m³
SO_2	3-hour	---	1,300 µg/m³
	24-hour	365 µg/m³	260 µg/m³
	12-Month	80 µg/m³	60 µg/m³
TSP	24-hour	260 µg/m³	150 µg/m³
	12-Month	75 µg/m³	60 µg/m³
Ozone	1-hour	0.12 ppm	0.08 ppm
Lead	3-month	1.5 µg/m³	1.5 µg/m³

a. All short-term (1-hr, 3-hr, 8-hr, and 24-hr) standards except ozone are not to be exceeded more than once per 12 month period, 3-month and 12-month standards are never to be exceeded. All averages are calculated as running or moving averages. The 12-month TSP standards are geometric means.

b. The actual form of each standard is listed first. The values in parentheses are approximations provided for convenience.

c. Based on a California ambient air quality standard. Represents a reference concentration, not a NJAAQS.

Based on facility-wide potential emission rates, Picatinny Arsenal is classified as a major source of air pollutants in accordance with the provisions of the New Jersey Administrative Code Title 7, Chapter 27, Subchapter 22 (NJAC 7-27:22) and is subject to the Federal Title V operating permit program requirements. Picatinny Arsenal is currently operating under a Title V Operating Permit issued by NJDEP (Source Operating Permit BOP070004). Picatinny Arsenal's Title V Operating Permit identifies significant, insignificant, and fugitive sources of air contaminant emissions from stationary sources on the installation. New air emission source activities are added to the permit as activities and operations dictate. New air emission sources, as well as modifications to existing sources, are identified and reviewed in the context of NJAC 7-27 and the CFR. Background emission estimates based on the operating permit are provided in Table 3-11.

Table 3-11. Picatinny Permitted Potential Pollutant Emissions as of May 2007 (Source Operating Permit: BOP070004)

Pollutant	Emissions (tons)
Volatile organic compounds (VOCs)	9.07
Nitrogen Oxides (NOx)	73.1
Carbon monoxide (CO)	42.1
Sulfur dioxide (SO_2)	25.2
Particulate matter , PM10	6.6
Total suspended particulates (TSP)	7.4

Pollutant	Emissions (tons)
Lead (Pb)	0.0084
Hazardous air pollutants (HAPs)	1.5

Prior to April 2008, open air detonation was conducted at Picatinny Arsenal. Emissions of air pollutants resulting from open air detonation were defined as fugitive emissions. Air regulations define such emissions "which could not reasonably pass through a stack, chimney, vent or other functionally-equivalent opening" as fugitive. Based on recent baseline air modeling analysis, the Arsenal could experience a short-term air quality impact for lead emissions. The modeling analysis is constantly updated as new proposed operations come online and does not address past activities. Measured ambient air quality data from NJDEP monitors in the vicinity of the Arsenal are summarized in Table 3-12 (Picatinny Arsenal, 2008b).

Table 3-12. Measured Ambient Concentrations in Vicinity of Picatinny Arsenal

Pollutant	Monitor Site	Averaging Period	Year	Measured Concentrations ($\mu g/m^3$)	Primary NAAQS/ NJAAQS ($\mu g/m^3$)	Percent of NAAQS/NJAAQS (%)
SO_2	Chester	3-hour	1999	138.6	1300[(a)]	10.7
		24-hour	1999	69.3	365	19.0
		Annual[(b)]	1998-2000	10.7	80	13.3
TSP	Phillipsburg	24-hour	1996	94.0	260	36.2
		Annual[(b)]	1997	40.4	75	53.9
PM_{10}	Clifton	24-hour	1998	63.0	150	42.0
		Annual[(c)]	1998	25.5	50	51.0
$PM_{2.5}$	Morristown	24-hour	2000	32.4	65	49.8
		Annual	2000	12.9	15	86.0
NO_2	Chester	1-hour	1998	130.1	470[(d)]	27.7
		Annual[(b)]	1998, 1999	23.0	100	23.0
CO	Morristown	1-hour	1998	7,340	40,000	18.4
		8-Hour	1999	4,777	10,000	47.8
Pb	New Brunswick	3-month	1999	0.183	1.5	12.2
O_3	Chester	1-hour	1999	237.6	235	101.1

(a) Secondary standard.
(b) Based on 12-month maximum for comparison to NJAAQS; NAAQS based on calendar year value, which is lower than 12-month maximum.
(c) Based on calendar year value for comparison to NAAQS; no comparable NJAAQS.
(d) NJDEP 1-hr guideline value; not an ambient standard.
(Source: Picatinny Arsenal, 2008a)

3.5.1.1 Climate, Greenhouse Gases, and Global Warming

GHGs are components of the atmosphere that trap heat relatively near the surface of the earth and, therefore, contribute to the greenhouse effect and global warming. The primary greenhouse gases are water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO), and O_3. Most GHGs occur naturally in the atmosphere, but increases in their concentration result from human activities, such as the burning of fossil fuels.

On October 30, 2009, EPA published a rule for the mandatory reporting of greenhouse gases (also referred to as 40 CFR part 98) from large GHG emissions sources in the United States. Implementation of 40 CFR Part 98 is referred to as the Greenhouse Gas Reporting Program (GHGRP). 40 CFR part 98 applies to direct greenhouse gas emitters, fossil fuel suppliers, and industrial gas suppliers. In general, the threshold for reporting is 25,000 metric tons or more of CO_2 equivalent per year.

Currently, Picatinny Arsenal is not designated as a major GHG source and is not subject to the reporting requirements. However, emissions of GHGs were quantified for this assessment.

3.5.1.2 General Conformity

EPA published *Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule* in the 30 November 1993, Federal Register (40 CFR Parts 6, 51, and 93). The U.S. Army Public Health Command (Provisional) published the *Technical Guide for Preparing a Record of Non-applicability for the Conformity Rule,* in November 2003 (Dempsey, et.al 2003). These publications provide implementing guidance to document CAA Conformity Determination requirements. Federal regulations state that no department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license to permit, or approve any activity that does not conform to an applicable implementation plan. It is the responsibility of the Federal agency to determine whether a Federal action conforms to the applicable implementation plan, before the action is taken (40 CFR Part 1 51.850[a]). The general conformity rule applies to Federal actions proposed within areas that are designated as either nonattainment or maintenance areas for a NAAQS for any of the criteria pollutants. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Emissions of pollutants for which an area is in attainment are exempt from conformity analyses.

The Proposed Action would occur within Morris County, New Jersey. This county is currently in nonattainment of the 8-hour O_3 and $PM_{2.5}$ NAAQS. Morris County is in attainment (or simply has not been designated) status for NO_2, SO_2, Pb, and PM_{10}. Since O_3 is not a direct emission and formed by reactions of VOCs and oxides of nitrogen (NO_x), both pollutants are applicable to the conformity rule.

3.5.2 *Environmental Consequences – Air Quality*

No Action Alternative

Implementing the No Action Alternative would require the transport of explosives, munitions, and other test materials by truck from Picatinny Arsenal, as well as the travel of ARDEC test personnel, to the designated Army or commercial locations. This would have minor impacts on regional air quality from the increased use of fossil fuels to transport materials, and the associated GHG emissions.

Preferred Alternative

Under the Preferred Alternative, ARDEC proposes the construction, operation, and maintenance of an underground SAFER. This alternative provides ARDEC with the capability to perform its munitions R&D mission, to include the vital mission of static detonation tests to verify performance prior to formal and costly technical and operational tests performed by the AMC Developmental Test Command and the Operational Test Command.

Implementing this alternative would have a negligible adverse impact on the overall air quality of the local airshed. Originally, the processes occurred on the open ranges. Though the processes would remain virtually identical to open detonation operations of the past, the SAFER would provide an enclosed structure that precludes fragments from becoming airborne and leaving the facility.

Airborne emissions would occur during the construction and operational phases of the proposed project. The SAFER's current design would vent testing gases from a single, large vent that would remove any real possibility of defining the SAFER emissions as fugitive. Further, operation of the SAFER would not be considered a new source of air pollutant emissions because detonation is not a State-regulated process. Based on the determination made by NJDEP, the SAFER would be considered a "non-point source," not requiring a permit for operation.

Construction. (Moderate Impact) Construction-related emissions associated with building the SAFER would be temporary (approximately six months) and produce no long-term effects on the regional airshed. Particulate matter transported by the wind as a result of excavations, rock blasting, and transportation of materials; fugitive dust from storage areas/sites and construction waste dumps; haul roads; and exhaust emissions from mobile sources and construction equipment would temporarily raise pollutant levels. Using the South Coast Air Quality Management District (SCAQMD) and EPA's Compilation of Air Emission Factors (AP-42) as guidelines, air emissions from the proposed construction projects were estimated for the non-attainment pollutants (in accordance with the conformity regulations).

Particulate matter and VOC emissions from paving the road to the SAFER site (less than one mile) were considered insignificant and not included in the analysis. The existing roadway would require only minor grading; therefore, particulate matter generation would be negligible. In addition, the asphalt used to pave the road would generate an insignificant amount of VOC emissions.

Table 3-13 summarizes the estimated short-term non-attainment pollutant emissions for the SAFER construction phase. Detailed emissions parameters used in the calculations are provided in Appendix A. It is anticipated that under this alternative, construction of the proposed SAFER would cause negligible adverse impact on long-term air quality.

Mitigation measures are not required because the Proposed Action is not expected to have significant adverse effects. However, there are several BMPs that may be employed to further reduce the moderate impacts to air quality that are expected as a result of construction activities. BMPs would be implemented to minimize generation of fugitive dust and gaseous air pollutants. These BMPs may include, but are not limited to, keeping haul roads watered down and turning off equipment when not in use. Federal and State regulations require all on-road vehicles and non-road construction equipment operating at, or visiting, the construction site comply with the three minute idling limit, pursuant to NJAC 7:27 14 and NJAC 7:27 15. b. All diesel non-road construction equipment operating at the construction site will use ultra-low sulfur diesel fuel (15 ppm sulfur) in accordance with the Federal Nonroad Diesel Rule, 40 CFR Parts 9, 69, 80, 86, 89,94, 1039, 1051, 1065, 1068. To further reduce harmful diesel exhaust emissions, ARDEC will encourage construction contractors for all nonroad diesel construction equipment greater than 100 horsepower used on the project for more than 10 days to have engines that meet the USEPA Tier 4 non road emission standards or the best available emission control technology that is technologically feasible for that application.

Rock blasting operations mobilize large amounts of material, and waste piles containing small size particles that are easily dispersed by the wind. As part of the construction phase, rock drilling and blasting would be required to loosen desired aggregate deposits. There are four primary types of explosives used for excavation of this type: dynamite, dynamite with ammonium nitrate, dynamite with nitroglycerine, and ANFO. ANFO would be used for the SAFER project at a maximum rate of 1,000 lbs per day and an approximate total of 78,000 lbs would be used during the entire project. Emission factors from AP-42, Section 11.9, were used to estimate pollutant emissions from the detonation of ANFO as well as the Australian Department of Climate Change 2008, Australian National Greenhouse Accounts Factors (CO_2). Emissions of NH_4NO_3 were also estimated as a by-product of incomplete combustion during detonation. A maximum of four percent of the total ANFO detonated was assumed to be entrained in the aggregate (rock) that is excavated after blasting. Emissions of NH_4NO_3 residue was assumed to be part of the fugitive particulate emissions generated from the filling and dumping of the blasted rock. A detailed emissions summary of ANFO emissions is provided in Appendix A. Using the estimates calculated in Table 3-13 and based on current data, rock blasting to support the construction of the proposed SAFER would cause negligible adverse impact on air quality.

Operations. (Moderate Impact) Appendix A provides the details for the items to be tested in the SAFER. The appendix reflects the operational profile by munitions item on an annual basis. Guidance received from the Picatinny Arsenal Environmental office regarding an acceptable method to demonstrate air emissions was to illustrate SAFER operations in terms of net explosive weight. As long as the munitions items detonated within the SAFER do not exceed a NEW limit, the emissions of air pollutants remain as modeled earlier. A "worst case" scenario was developed to ensure emissions thresholds would not be exceeded. The munitions item with the highest individual value of NEW is the 155mm projectile (M795). The worst case test scenario consisted of conducting two test events in the morning and two test events in the afternoon with up to six, 155mm artillery projectiles each possessing the maximum NEW of any possible test item (i.e., 23.8 lbs). A maximum of 240 test event per year was used to develop the total annual NEW. A second operational test scenario was based on identifying the munitions item with the highest quantity of Pb as a constituent (required because of the NJDEP comprehensive risk assessment for HAPs. The primary HAPs of concern for this assessment is Pb and NH_4NO_3. Using the same test scenario (i.e., two tests in the morning and two in the afternoon), a worst case maximum Pb emissions were determined. The SAFER operational (annual) emissions estimates were based on the Dugway Proving Ground Bang Box emission factors obtained from the Strategic Environmental Research and Development Program (SERDP) Open Burn/Open Detonation Dispersion emission factors database and the *Emission*

Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD), August 1998 (EPA/600/R-98/103).

Operational emissions include emissions produced from an electric generator that would serve as the main power source when the SAFER is in operation. The generator is a John Deere Industrial Model 4024HF285, liquid cooled, 1800 rpm diesel-fueled engine.[11] Emissions test data provided by the manufacturer were used for this assessment. Table 3-13 summarizes the total emissions associated with the worst case scenario for operating the SAFER for 240 test events per year. Using the estimates calculated in Table 3-14 and based on current data, operational emissions from the proposed SAFER would cause negligible adverse impact on air quality.

The Picatinny Arsenal Air Quality Manager conducted an Air Dispersion Modeling Analysis using the computer simulation model AERMOD to evaluate the impacts of hazardous air pollutants that would be generated from contained detonation. AERMOD, an EPA-approved steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, includes treatment of surface and elevated sources and simple and complex terrain. A HAP impact analysis for Pb was also conducted to assess the incremental impacts using current facility-wide air emission sources. The analysis addressed the following concerns:

- Are the emissions from the SAFER migrating beyond the installation boundary at levels considered significant?
- Are cumulative emissions from the SAFER and existing facilities migrating beyond the installation boundary at levels considered significant?
- Based on a worst case scenario, would the emissions exceed the NAAQS and NJAAQS?

The results of the modeling show that ambient air quality impacts from the proposed SAFER would be below protective inhalation concentrations for all criteria pollutants and lead. The predicted ambient air concentrations of Pb from the cumulative operation of existing operations and the proposed addition of the SAFER would be below the NAAQS and NJAAQS.

The modeled lead concentration was compared to its corresponding Inhalation Reference Concentration (RfC) to determine risk using the NJDEP Division of Air Quality "Risk Screening Worksheet for Long-Term Carcinogenic and Noncarcinogenic Effects and Short-Term Effects" (NJDEP, 2011a). The RfC is defined as the continuous inhalation exposure of a chemical that is likely to be without risk of deleterious effects during the lifetime of a receptor. The NJDEP RfC establishes the level where there would be no significant risk to prenatal and/or child development. The risk assessment is used to assess future cumulative impacts on the surrounding communities from facility-wide operations.

Predicted ambient air concentrations for lead were compared to two standards: the NAAQS and NJAAQS. Both standards are established to protect human health and the environment from inhalation exposure. The NAAQS is 0.15 micrograms per cubic meter ($\mu g/m^3$) and the NJAAQS is 1.5 $\mu g/m^3$ based on a 3-month averaging period. The predicted maximum 3-month average lead concentration for the above-described scenario is 0.000375 $\mu g/m^3$.

[11] The John Deere generator will be added to the existing Title V Operating Permit covering Picatinny Arsenal operations as part of the permitting actions required for the proposed SAFER.

The NJDEP RfC is 0.1 μg/m^3 and based on a short-term (24-hour) averaging period. The predicted lead concentration was compared directly to the NJDEP RfC. This comparison is overly conservative as it assumes that an individual would spend 24 hours/day, 365 days/year, for 25 years standing at the area of highest lead concentration just outside the Arsenal's fence line. The predicted maximum 24-hour lead concentration of 0.000215 μg/m^3 is significantly less than the NJDEP RfC for Pb.

The assessment of the incremental impact of the SAFER was based on the highest 3-month and 24-hour predicted concentrations for air borne Pb at the installation boundary. The highest predicted 3-month average contribution is 3.75×10^{-5} μg/m^3. Based on a previous EA of the T-10 Detonation Chamber, the 3-month average modeled cumulative lead impact for the entire facility was 0.18586 μg/m^3. The highest predicted 24-hour average contribution is 2.15×10^{-4}. Based on a previous EA of the T-10 Detonation Chamber, the 24-hour modeled cumulative lead impact for the entire facility was 0.70010 μg/m^3. Based on this assessment, the predicted cumulative concentration of Pb would not increase significantly due to the installation of the SAFER (Picatinny Arsenal, 2008b).

Greenhouse gases were assessed for the proposed construction of the SAFER. Where possible, the assessment was conducted in accordance with the guidelines set out by the EPA reporting requirements. The assessment of the greenhouse gas emissions associated with the proposed project was conducted and involved:

- Identification of the likely sources of greenhouse gas emissions
- Estimating the likely quantities of greenhouse gases from these sources
- Nominating emission factors for the greenhouse gas sources

Greenhouse gas emission sources identified for the SAFER include fuel consumption of construction equipment and vehicles and combustion of ANFO for blasting.

The Preferred Alternative would constitute a short-term minor increase in the use of fossil fuel and associated GHG emissions during construction. GHG emissions would occur as a result of project construction. The Preferred Alternative would result in the release of approximately 1,251.6 metric tons of equivalent of CO_2 emissions. The draft guidance includes a presumptive effects threshold of 25,000 metric tons of CO_2 equivalent emissions from an action (CEQ, 2010). The GHG emissions associated with the Preferred Alternative are well below the CEQ threshold. Therefore, GHG emissions from the Preferred Alternative would not contribute appreciably to climate change or global warming.

Emissions of air pollutants associated with the operation of the SAFER would be no greater than current totals for the existing processes being conducted on open ranges at the Arsenal. Appendix A summarizes the total emissions associated with the construction of the SAFER and results in a contribution of less than 100 pounds per year of any criteria pollutant. Operation of the SAFER would not introduce any new air pollutants. Range operations at the Arsenal are categorized as fugitive emissions and are not subject to the provision of the Arsenal's operating permit. However, they are inventoried and reported annually in the installation's annual emissions statement. When compared to the *de minimis* values of 100 tons per year (TPY) of Nitrous Oxides (NO_x), 50 TPY for volatile organic compounds (VOC) and 50 TPY for particulate matter ($PM_{2.5}$), the emissions associated with implementing the proposed action are below the *de minimis* levels. As a result the Proposed Action to build the SAFER is not significant and is not subject to the General Conformity rule requirements (Appendix A contains the Record of Non-applicability).

Table 3-13. SAFER Project Emissions Summary

Activity	Total Estimated Emissions (lbs)[1]									
	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	ROG	Pb	NH_4NO_3
Rock Blasting (ANFO)	2,743.7	696.2	81.9	4,136.0	450.5	13,923.0	---	---	---	0.2
Construction Equipment (off-road and non-road)[4]	4,190.7	12,060.3	12.0	540.0	270.0	1,091,778.7	99.7	1,100.7	---	---
Construction Vehicles (off-site/on-site)	1,205.4	1,334.7	2.2	13.5	5.1	1,648,021.0	141.9	151.8	---	---
Site Clearing [4]	136.8	297.7	53.2	354.2	177.1	58.9	16.8	24.1	---	---
Fugitive (PM) Road Dust - All Vehicles	---	---	---	4,797.7	450.4	---	---	---	---	---
Fugitive (PM) Dust - Construction Operations	---	---	---	9,079.8	908.0	---	---	---	---	---
SAFER Operations - Post Construction (annual)	2,342.5	460.1	4.8	6,665.8	2,460.5	---	---	---	0.1	---
TOTAL EMISSIONS (lbs)	**10,619.1**	**14,848.9**	**154.2**	**25,586.9**	**4,721.5**	**2,753,781.7**	**258.4**	**1,276.6**	**0.1**	**0.2**
TOTAL EMISSIONS (Tons)	**5.3**	**7.4**	**0.1**	**12.8**	**2.4**	**1,376.9**	**0.1**	**0.6**	**0.0001**	**0.0001**
PTA Existing Annual Emissions (2009)	**46.90**	**14.00**	**25.50**	**9.08**	**---**	**---**	**---**	**11.40**	**0.01**	**---**
EPA/NJDEP Major Source Thresholds (Tons per year)	**100**	**25**	**100**	**100**	**---**	**25,000**	**---**	**25**	**---**	**---**
Significant? [2]	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

(1) N_2O is counted as NOx emissions. ROG is counted as VOC emissions
(2) Based on SAFER Operational (annual emissions) added to existing PTA emissions statement from 2009
(3) Relative ratio of PM2.5 to PM10 is 0.37 for Operational Emissions. (Based on Nevada Test Site particulate data using 155mm rounds)
(4) Assuming PM2.5 50% of PM10 for equipment used for construction and site clearing.

Table 3-14. Air Dispersion Modeling Results of Predicted Fenceline Concentrations

	1-hour		3-hour		8-hour		24-hour		Month		Annual	
	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)
NO_x	11.44	188	---	---	---	---	---	---	---	---	0.06	100
Pb	---	---	---	---	---	---	2.15E-04	1.00E-01	3.57E-05	1.50E-01	---	---
CO	73.24	40,000	---	---	11.98	10,000	---	---	---	---	---	---
SO_2	0.15	200	0.05	1300	----	---	---	---	---	---	---	---
PM_{10}	---	---	---	---	---	---	12.01	150	---	---	---	---
$PM_{2.5}$	---	---	---	---	---	---	12.01	35	---	---	---	---

3.6 Geology & Soils

This element evaluates the potential for the recommended action to cause soil erosion, impact establishment of native vegetation and/or increase sedimentation to surface waters. The ROI for this element is the area surrounding the range road and resources surrounding the proposed SAFER.

3.6.1 *Affected Environment – Geology & Soils*

The proposed SAFER site is located in the New Jersey Highlands physiographic province, which ranges from 12-18 miles wide, between the Appalachian Piedmont physiographic province to the southeast and the Valley and Ridge province in the northwest. The area is made of flat-topped ridges and deep, low-lying and narrow valleys, relative to the surrounding topography. It is bordered by the steeply sloping ridges of Green Pond Mountain to the west and undifferentiated metamorphic/igneous rock to the east (Copperas Mountain). These ridges reach an average elevation of 1,000 to approximately 1,200 feet above MSL within 500 feet of the valley axis.

Underneath the Arsenal are four bedrock formations that include Precambrian Basement and three lower Paleozoic sedimentary formations (Hardyston Quartzite, Leithsville Formation, and Green Pond Conglomerate). The valley fill is made-up of Pleistocene glacial deposits and small amounts of alluvium. Seventy-five percent of the basement compound consists of gneissic homblende granite and alaskite. The granites are mostly made-up of microperthite, quartz, hornblende, and plaglocase, while the alaskite is linked to magnetite ore deposits. In New Jersey, the Hardyston Quartzite ranges from a quartzite to a conglomerate and varies in thickness from a few feet to about 200 feet. The Hardyston Quartzite contains a small area of glacial deposits in the southeastern part of the Arsenal. The proposed SAFER site is located primarily in the Green Pond Conglomerate.

The major fault system associated with the Gorge area is the Rockaway Valley Fault, which extends from the southwest to the northeast in Morris County. The Mount Hope Fault, located in the southwest portion of Morris County, is oriented nearly perpendicular to the Rockaway Fault. Numerous smaller faults are associated with these major fault systems.

New Jersey soil can be categorized into two main categories: soil that is highly disturbed by human influence, and soils primarily resulting from past glacial activity. The Soil Survey of Morris County, New Jersey, identifies 27 different soil types in the Arsenal, four of which are classified as disturbed areas as a result of human activities. The majority of these soils are mapped in the central and southwestern portion of the Arsenal where extensive filling activities have occurred in areas that were previously poorly drained. The remainder of the soil is closely related to the underlying geologic formations and past glacial influences (some contain high amounts of stone and/or gravel).

The soil surrounding the project site is underlain by three different mapping units:

- Ridgebury loam, 0–8% slopes (extremely stony)
- Rockaway rock outcrop, 8–15% slopes
- Rockaway rock outcrop 15–25% slopes

The geology for the Preferred Alternative was determined by reviewing lithologic boring logs recorded during the development of six wells in and around the Arsenal (Shaw, 2003). The logs indicate that the site overburden is composed of a poorly sorted heterogeneous mixture of boulders and gravel in a silty sand matrix, with trace amounts of clay. The variable sedimentary sequence is a function of the complex geomorphic conditions, resulting from the redistribution of glacial, talus and stream-related sediments. The logs also reveal that a maximum of 3-10 feet of artificial fill composed of varying amounts of sand, gravel, cobbles, boulders and rubble covers the entire site (Shaw, 2003). Supplemental information regarding the site was obtained from vertical and 45°-angle borings taken during a geological survey in April/May of 2010 by the construction contractor, CPI. CPI's findings are reported in *ARDEC Project Rock Stability Report* (CPI, 2010). Groundwater was encountered at varying depths during the survey.

3.6.2 *Environmental Consequences – Geology & Soils*

No Action Alternative

Implementing the No Action Alternative would have no impact on the geology or soils in the area.

Preferred Alternative

Construction. (Minor Impact) Implementing the Preferred Alternative would result in short-term, minor direct impacts to the soil during the construction phase. Impacts from clearing and construction would include the removal of herbaceous vegetation, increased sedimentation to Green Pond Brook, as well as soil erosion during construction and excavation activities. These impacts are discussed in more detail in the wetlands and natural resources sections of this document.

Increased vehicular traffic during construction activities would cause a short-term, minimal increase of sedimentation to Green Pond Brook due to the distance of the unpaved road from the brook coupled with the unique site topography. The road entering the unpaved portion of the range area starts out at a lower elevation than the brook. The road then continues up in elevation, beyond the brook, around a bend and follows a steep hill until it reaches the construction site. Sedimentation from the actual construction traffic that passes on the road may enter the brook; however, implementation of proper controls would minimize this impact. Furthermore, because the anticipated construction period is temporary, it is anticipated that the increased traffic would create a minor and temporary indirect impact from sedimentation.

Implementing the Preferred Alternative would also have short-term minor direct impacts on the site geology. Impacts would include the removal of rock during the blasting and construction of the SAFER. Additionally, blasting may cause some fracturing in the rock around the SAFER, but it is expected to be minimal. CPI indicated that the impacts would be limited to 6 to 12 feet radial fractures (CPI, 2010). These impacts are considered minor because the bedrock is not a unique resource and the construction of the SAFER would not result in an alteration of the regional geology.

There would be no impact to the Rockaway Valley Fault from the blasting during the construction of the SAFER. The Rockaway Valley Fault is an older fault that has rehealed and is not an active fault. Furthermore, mining activities typically occur through underground faults with no impacts.

There would be some direct impact to soils and associated wetlands during construction of the SAFER. All activities would be conducted in compliance with the State of New Jersey regulations, including soil erosion, sediment control and storm water control requirements. Clearing and construction activities at the site would include the removal of herbaceous vegetation, increased sedimentation to Green Pond Brook, and soil erosion during construction and excavation activities.

Note that, as part of the Arsenal's NJDEP Special Activity Transition Area Waiver Permit, herbaceous shrubs would be planted in the transitional areas to help mitigate the impact to wetlands. For additional details, see Section 3.8, Wetlands.

Mitigation. Install temporary silt fences to minimize traffic and construction-related erosion. In addition, implement additional measures and Best Management Practices as specified in Erosion and Sediment Control Plans to be approved by the Morris County Soil Conservation District.

Operations. (Minor Impact) Minimal indirect impacts to the geology or soils would occur once as all detonation activities would be conducted within the SAFER chamber. Localized groundwater could also be encountered when blasting during the construction phase. Although not anticipated, if groundwater is encountered, additional analysis and evaluation would be conducted. The construction contractor would also be responsible for developing mitigation measures that may require obtaining a dewatering permit.

Soil erosion would be minimal once the SAFER has been constructed. Activities would be conducted underground within the chamber, and as such, erosion is not anticipated to occur.

3.7 Water Resources

Groundwater and surface water in the Gorge area are intimately related. This section describes the various streams and water bodies in and around the Gorge area, focusing on potential impacts due to the SAFER proposed action.

3.7.1 *Affected Environment – Water Resources*

Figure 3-3 shows the various major water bodies in the vicinity of the Gorge area. The southwest tip of Lake Denmark is shown in the upper right corner of the figure, while the northeast tip of Picatinny Lake appears in the lower left corner of the figure. Green Pond Brook is shown coming out of the Gorge area at the center of the top edge of the figure. It merges with the southern leg of Burnt Meadow Brook, which flows from the southwest tip of Lake Denmark.

The black triangle in Figure 3-3 shows the location of a U.S. Geological Survey (USGS) monitoring station that measures the gate height and corresponding flow of Green Pond Brook as it emerges from the Gorge area. The station is not currently in operation, and only three data sets are available for this station from the USGS: one from the late 1960s and two from the early 1980s. Stream flow rate influences many of the parameters that could potentially impact the water quality of Green Pond Brook. Because the stream flow rate is an important variable for estimating the SAFER project's potential impacts on Green Pond Brook, the flow rate was estimated using the data from this station along with other available data, as described in Section 3.7.2.

Seasonal variations in precipitation impact the water accumulation and drainage pattern of the area. The annual snowfall averages 40 to 50 inches. This snowfall accounts for the majority of the annual precipitation, which is reported to be between 43 and 51 inches (ONJSC, 2010). With an average of 163 freeze days (ONJSC, 2010), the accumulation of snow and subsequent snow melt in the spring results in an annual filling and draining of the surface rubble/glacial sediments and fractured subsurface of the mountains that flank the Gorge.

Groundwater within Copperas Mountain in the vicinity of the SAFER site flows toward Green Pond Brook, but it is intercepted by a fault that diverts the flow to the southwest until it emerges at a perennial spring located about two-thirds of a mile away (approximate coordinates: 40°58’14” N, 74°31’56” W). The southern tip of Copperas Mountain is shown in the upper right portion of Figure 3-3. The elevation of the spring is approximately 150 to 170 feet below the construction site. The spring water then flows to Green Pond Brook.

Most of the water contained in the mountain (referred to as the Upper Groundwater Aquifer in the Groundwater Modeling Report) is melted snow that infiltrates through the upper layer of soil and rubble and fills all of the cracks and fissures in the mountain. As the seasons progress, the mountain drains, the water table falls, spring flow rates diminish, and Green Pond Brook flow rates shrink accordingly. The cycle is repeated annually, with recharge of the Upper Groundwater Aquifer occurring in the winter and spring. Data obtained during the Hydrogeologic Study conducted in 2012 (CPI, 2012b) indicate seasonal groundwater elevation fluctuations as high as 30 to 40 feet. In July 2012, depth to groundwater ranged from approximately 25 to 40 feet. In September 2012, following several months of drought-like conditions, groundwater was encountered much deeper, ranging from 50 to 68 feet below the ground surface.

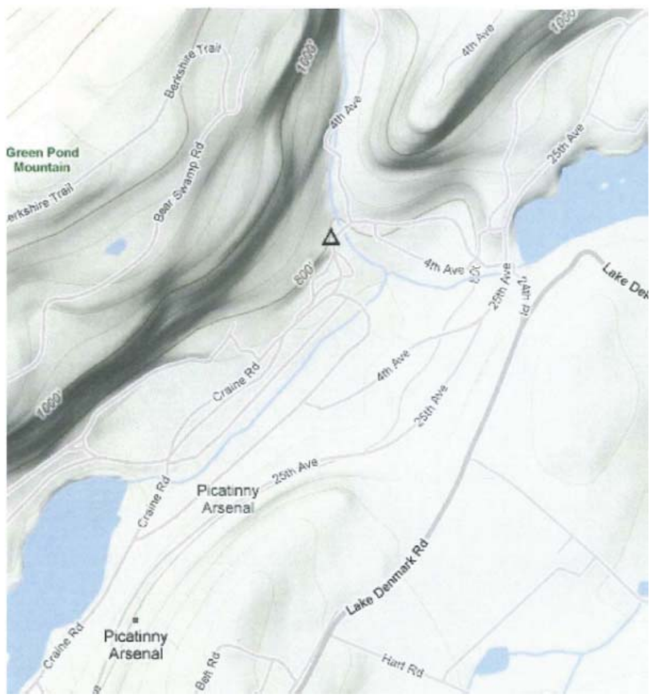

Figure 3-3. Water Bodies in the Vicinity of the Gorge Area

For a more detailed description of the groundwater resources, see the first section of the Groundwater Modeling Report in Appendix B.

3.7.2 *Water Resources Affected by the SAFER*

Water resources that could potentially be impacted by the SAFER project include: (1) groundwater immediately beneath the construction area (i.e., faceup, adits, chamber) and the rock storage areas that receive excavated rock from the construction site, (2) groundwater in the fault that receives groundwater flow from beneath the project area, (3) the spring that discharges from the fault, (4) Green Pond Brook, and (5) downstream surface water bodies including Picatinny Lake. The focus of the following sections is on water resources upgradient/upstream of and including Green Pond Brook. If it is shown that the impact on Green Pond Brook is insignificant, no analysis is needed for downstream bodies of water.

The SAFER location is on the west slope of the Copperas Mountain Ridge. In the immediate area of the project, groundwater is dominated by near-lateral flow, due to the influence of the nearby fault that drains the entire mountainside. Consequently, very little water from the project site flows vertically from the Upper Bedrock Aquifer to the Lower Bedrock Aquifer.

Water resources were assessed for potential project impacts including contamination of both groundwater and surface water with construction-phase explosives, and changes in water flow rate, temperature, and pH in Green Pond Brook. Sections 3.7.2.1 and 3.7.2.2 describe the methodologies used and the results of these analyses for groundwater and surface water, respectively.

3.7.2.1 Groundwater

Groundwater flow characteristics in the Gorge area are dictated by the aquifer structure and physical characteristics (see Appendix B). Groundwater is primarily encountered in fractures and bedding planes within bedrock, but may also be present in thicker layers of overburden. Bedrock groundwater generally discharges into the unconsolidated overburden materials and then into surface water features such as Green Pond Brook. A fault at the proposed SAFER site receives most of the local groundwater flow and redirects it to a spring about six tenths of a mile away.

During the initial geological survey for the site, conducted in April/May 2010, groundwater samples from seven boreholes were collected and analyzed. Although there was slight variation between the results for the fault area and the upgradient rock (e.g., slightly higher organic content), the sample results generally indicated that the tested groundwater was similar to what might be expected of surface water originating from precipitation and snowmelt: near neutral pH[12]; low total organic carbon (TOC)[13] [~1 ppm]; and total nitrogen, ammonia, nitrate, biochemical oxygen demand (BOD)[14], chemical oxygen demand (COD)[15]—all near or below detection limits. This suggests that little in the way of minerals or organic compounds are contributed to groundwater by the surface soils and aquifer through which the groundwater flows. See the Groundwater Modeling Report (Appendix B) for detailed analytical results.

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[12] pH is a measure of the amount of free hydrogen ions in water. A pH value of 7 is neutral, whereas below 7 indicates some level of acidity, and above 7 indicates more alkaline conditions. Stream inhabitants (e.g., fish and invertebrates) may be affected by changes in the water's pH.

[13] TOC is a measure of the organic material resulting from decaying vegetation, bacterial growth, and the metabolic activities of living organisms. It also includes carbon from spilled petroleum products, if any. TOC in surface waters comes from decaying organic material and sometimes from synthetic sources.

[14] BOD is a measure of the amount of oxygen that bacteria will consume while decomposing organic matter. As bacteria in the water decompose organic materials (e.g., waste from treatment plants, septic systems, urban runoff, etc.) they use up dissolved oxygen (DO) and reduce the amount of DO available for fish.

[15] COD is a measure of the total quantity of oxygen required to oxidize all organic material into carbon dioxide and water.

A hydrogeologic study was conducted in 2012 (CPI, 2012b) to more fully characterize local groundwater conditions. Three new monitoring wells (TW-1 through TW-3) were installed in May 2012 were conducted to evaluate permeability of the bedrock beneath the proposed SAFER site. A fourth well (TW-4/MW-1) was installed in September 2012 at the entrance to the faceup area to assess a possible fault zone in this area. Although planned for installation upgradient, sidegradient, and downgradient of the SAFER site, drill rig access restrictions limited well installation to areas along the access road. Consequently, based on a groundwater flow direction to the northwest, none of the new wells is located hydraulically downgradient of the proposed chamber location.

Pumping tests conducted during the hydrogeologic study indicate that the bedrock is not a high yielding aquifer. Calculated hydraulic conductivities ranged from 0.0041 to 0.062 feet per day. A slug test performed on well TW-4/MW-1 indicated very low hydraulic conductivity (i.e., likely well less than 0.001 feet per day) in the proposed location of the faceup area. The boring log of TW-4/MW-1 indicates very competent bedrock overlain by 28 feet of a high permeability overburden layer.

Potential Contamination

To assess the potential contamination impact of the SAFER project on water resources, groundwater modeling was performed using SESOIL soil leachate and groundwater modeling software as a first step to simulate “worst-case” conditions (i.e., using conservative assumptions and approximations). Ranges of the various parameter values required by the model (e.g., hydraulic conductivity) were selected (i.e., higher than and lower than the estimated value at the site), and model simulations were performed to see the effect on the resulting contaminant concentration from varying the parameter values. The “worst case” represents the model result, using the parameter values that yielded the maximum contaminant results in the previous runs in which individual values were varied. Details of the groundwater modeling and subsequent calculations to assess potential contaminant concentrations in associated surface water features can be found in the Groundwater Modeling Report (Appendix B).

Only construction conditions were modeled because built-in mitigation measures (e.g., geo-liner and concrete flooring) for the facility would preclude contact of contaminants with groundwater during normal operation of the test facility. ANFO is the only explosive to be used during construction and was the only modeled contaminant in the modeling effort.

The Groundwater Modeling Report provides estimates of “worst-case” groundwater concentrations in the mixing zone beneath the three construction areas. This scenario assumes that four percent of the ANFO used in blasting is unreacted (AMEC, 2004; DDMI, 2006) and that approximately five percent of the residual ANFO remains on site and available for transport into groundwater beneath the floor of the SAFER facility. ANFO residue remaining on blasted rock surfaces (95 percent of the unreacted ANFO) will be transported to Rock Storage Area A and Rock Storage Area B, and may migrate into underlying soil and groundwater at that location. Because ammonium nitrate readily dissociates in water, use of a less soluble form of ANFO (e.g., gel-based or emulsified ANFO) may reduce availability of residual ANFO and subsequent migration into the environment at the SAFER site and rock storage areas. Nevertheless, mitigation measures may be required to minimize environmental (water resource) impacts associated with residual ANFO. Such measures are discussed in Section 3.7.3, *Environmental Consequences*.

The SESOIL model results for the worst-case scenario as a function of the month of construction (see Table 3-4 in Appendix B) indicate that nitrate concentrations would not exceed the maximum contaminant level (MCL) for nitrate (10 milligrams per liter [mg/L]) immediately below the faceup area, adits, or chamber construction areas. Modeling ANFO as ammonium and nitrate, and using loading rates calculated from the blasting schedule provided by CPI, SESOIL predicts maximum nitrate concentrations of 0.016 (January, February, and November), 1.92 (August), and 8.65 (August) mg/L, respectively. Taking adsorption of ammonia on solid surfaces into account, maximum groundwater concentrations of ammonium predicted by the model and corresponding months of construction for the mixing zone beneath the faceup, adits, and chamber were 0.0013 (October), 0.56 (August), and 2.57 (August) mg/L, respectively. As with nitrate, downgradient dilution reduced ammonia concentrations substantially.

As a note, EPA has not established an MCL for ammonia in drinking water, but the State of New Jersey Groundwater Quality Criterion for total ammonia in Class IIA aquifers is 3 mg/L (NJAC 7:9C).

No human or ecological receptors would come in contact with groundwater before it reaches the spring. Model predictions represent incremental concentrations that would augment current background levels. Maximum reported incremental concentrations of ammonium and nitrate emanating from beneath the construction site do not exceed current groundwater standards and would be further diluted prior to emerging at the spring. However, a detailed monitoring plan would be prepared for the construction project when the NEPA analysis is complete, and before initiating construction activity. At the SAFER site, the monitoring program would include sampling of groundwater, the spring, and surface water at Green Pond Brook. The plan would also contain stop-work provisions in the event that significant adverse impacts are discovered.

3.7.2.2 Surface Water

Concentrations of both ammonia and nitrate have been researched and documented, below which ecological impacts are not observed. For ammonia, the results are complex and dependent on both temperature and pH. See Section 3.0 of Appendix B for details.

Historical data for the Gorge area are sparse. A surface water survey was performed on July 22, 2010, specifically to provide background data on Green Pond Brook prior to construction of the SAFER. Budgetary constraints and other considerations resulted in foregoing the quality control sampling and analyses that would normally accompany a formal survey. The results of the survey are presented in Attachment 4, *Field Report*, in the Groundwater Modeling Report (Appendix B).

The impact on Green Pond Brook is a focus of concern due to its classification as a Category One stream. Due to this classification, there would be “no measurable changes” in water quality, as established by antidegradation policies for all surface waters of the State of New Jersey at NJAC 7:9B. To address potential changes, flow, pH, and temperature characteristics, as well as the pre-construction concentrations of ammonia and nitrate, were examined.

Data associated with the July 22, 2010, survey (see Appendix B) indicate the following regarding baseline nitrate and ammonia concentrations in Green Pond Brook:

- Nitrate concentrations varied from non-detect (a single sample) to 0.15 mg/L, with an average stream concentration of 0.13 mg/L
- Ammonia concentrations varied from non-detect (three out of four stream water samples) to 0.12 mg/L (a single sample from a ponded area).

Potential Contamination

As stated previously, contaminant loadings from water beneath the construction area that eventually reach the stream must be added to the concentrations already present to assess the potential impact to the stream.

Table 3-15 is adapted from Table 3-4 in the Groundwater Modeling Report, Appendix B, to illustrate the potential impact of construction activities on stream nitrate and ammonium concentrations, assuming a 1.5 percent dilution (discussed later in this section), obtained from metered flow data and estimated construction site groundwater flow rates. This value agrees fairly well with the overall dilution of 50:1 (2 percent–5:1 dilution at the fault and 10:1 dilution at the stream) used in the Groundwater Modeling Report (Appendix B) to estimate the additional dilution that could be expected after water from the faceup area mixing zone enters the fault. The 50:1 ratio was based on field observations/estimates and engineering judgment.

This table shows the impacts of activities in the three construction zones independently. Nitrate is expected to flush through the groundwater/surface water system with minimal interaction with the media through which it would flow. Because the construction in the three zones is scheduled to be in sequence, no additive effects are anticipated. The predicted ammonium concentrations are substantially lower for two reasons: (1) although the molar ratio of ammonium to nitrate is 1:1, the mass ratio is approximately 0.29 and (2) minor adsorption of ammonium onto media surfaces is anticipated. SESOIL model predictions indicate that the ammonium would flush out of the system as well, but it may take several months to complete the flush. The adsorption process and consequent retardation of the ammonium is temperature sensitive. Ammonium retardation was not explored further because even if the ammonium peaks were additive for the three construction phases, adding their sum to the background concentration would still result in an impact that would be immeasurably low.

Table 3-15. Potential Peak Nitrate and Ammonium Concentrations by Month of Construction*

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Faceup												
Nitrate	0.13024	0.13024	0.13023	0.13006	0.13005	0.13005	0.13005	0.13005	0.13003	0.13021	0.13024	0.13023
Ammonium	0.12001	0.12001	0.12001	0.12002	0.12002	0.12002	0.12002	0.12002	0.12002	0.12002	0.12001	0.12003
Adits												
Nitrate	0.13004	0.13004	0.13004	0.13004	0.13004	0.13004	0.13004	0.13005	0.13004	0.13004	0.13004	0.13004
Ammonium	0.12001	0.12001	0.12001	0.12001	0.12001	0.12001	0.12001	0.12001	0.12001	0.12001	0.12001	0.12001
Chamber												
Nitrate	0.13041	0.13036	0.13035	0.13029	0.13029	0.13031	0.13033	0.13047	0.13033	0.13037	0.13041	0.13038
Ammonium	0.12012	0.12011	0.12010	0.12009	0.12009	0.12009	0.12010	0.12014	0.12012	0.12011	0.12012	0.12011

*Sum of stream baseline concentrations (0.13 mg/L for nitrate and 0.12 mg/L for ammonia) and "worst-case" peak concentrations (mg/L) from construction by month of construction, assuming an overall dilution to 1.5%.

Numerous EPA-approved methods are available to measure ammonia and nitrate concentrations in water. Analytical method sensitivities for nitrate and ammonia in water by approved EPA methods at concentrations near the measured background levels for nitrate and ammonium are quite low (between 1 and 2 micrograms per liter or parts per billion [ppb], depending on the concentration range). However, the projected concentration increases are below the analytical method sensitivities. Also, all projected increases in stream nitrate and ammonium concentration would be both extremely small and transient.

Flow

Data from the USGS monitoring station depicted in Figure 3-3 at the outlet from the Gorge area is sparse. Only three readings are reported on the USGS Web site for this station (USGS, 2010a). However, the USGS also operates a station that has been in consistent operation since 1982, monitoring Green Pond Brook at the inlet to Picatinny Lake (USGS, 2010b). At this location, it measures the combined flow from Green Pond Brook in the Gorge area and Burnt Meadow Brook, which receives the discharge from Lake Denmark. Two of the three data sets from the first monitoring station overlap with data presented for the second station. The dates of the data sets ─ October 5, 1982, and September 10, 1984 ─ correspond to the dry part of the year. Since the flow in Burnt Meadow Brook should vary in a manner similar to that of Green Pond Brook (low flow in the dry season and high flow during the spring melt), the flow in Green Pond Brook can be estimated by looking at the ratios of readings from the two monitoring stations.

On October 5, 1982, the reported stream flow rates for Green Pond Brook at the monitoring station at the outlet from the Gorge and at the inlet to Picatinny Lake were 0.896 cubic feet per second (cfs) and 3.51 cfs, respectively. The corresponding ratio is 0.26. On September 10, 1984, the reported stream flow rates for Green Pond Brook at the monitoring station at the outlet from the Gorge and at the inlet to Picatinny Lake were 1.46 cfs and 3.62 cfs, respectively, and the corresponding ratio is 0.40. The average of the two ratios is 0.33, so that the flow in Green Pond Brook should be approximately one-third of the flow reported at the inlet to Picatinny Lake. Table 3-16 contains the data reported by the USGS for Green Pond Brook at the inlet to Picatinny Lake. The data are used in the evaluation of potential temperature and pH effects on Green Pond Brook are discussed later in this document.

Table 3-16. Flow Rates in Green Pond Brook at the Inlet to Picatinny Lake*

YEAR	00060, Discharge, cubic feet per second, Monthly mean in cfs (Calculation Period: 1982-10-01 -> 2009-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1982										3.51	3.89	7.64
1983	15.9	20.7	49.5	64.1	20.6	14.8	4.1	3.62	2.63	3	7.62	40.8
1984	12.2	22.6	26.4	56.2	28.6	16.8	32.6	6.1	3.62	2.31	2.07	5.46
1985	7.3	9.77	10.5	3.84	9.28	10.7	6.91	5.08	6.41	10.5	19	17.7
1986	14.3	22.6	25.5	26.1	9.99	10.2	4.08	12.3	5.12	4.56	18.6	34.1
1987	17.5	10.6	18.6	38.5	9.83	3.54	4.2	5.58	24.7	18.1	19	18
1988	10	16.2	19.8	10	14.8	5.52	3.8	3.9	4.16	3.08	8.89	6.76
1989	6.69	7.58	13.3	17.7	50.6	18.3	6.71	4.7	7.52	26.1	19.4	6.53
1990	16.1	21.8	11.4	14.5	37.5	14.4	15.3	20.9	9.41	10.3	11.7	29
1991	19.3	12.7	21.8	17.7	13.7	5.62	2.65	2.13	2.12	2.43	2.32	5.29
1992	5.85	5.92	16.4	13.3	8.38	21.8	7.23	6.15	5.42	3.2	13.1	26.3
1993	22	12.4	33.3	43.9	9	4.48	3.37	2.85	2.79	3.31	5.35	17.9
1994	12.3	20.5	40.1	30.3	12.1	7.7	6.43	5.52	4.41	2.48	6.41	15.6
1995	17.7	7.8	19.9	7.27	5.77	4.29	4.62	3.6	1.77	6.18	22.4	7.57
1996	45.5	32	27.2	29.4	22.3	5.99	14.3	4.07	4.15	20.9	14.3	49.5
1997	11.2	15.1	17.9	24.8	11.2	3.92	3.46	3.66	3.83	0.681	6.76	7.62
1998	23.5	26.4	21.5	27	36.9	29.1	4.08	2.19	1.36	0.965	0.53	0.552
1999	16.8	18.5	31.5	9.95	4.49	2.55	1.71	1.49	10.2	7.05	13.2	12.2
2000	11.3	14.2	22.4	15.7	14.6	12.7	7.89	31.9	5.06	3.25	3.29	11.6
2001	10.5	17.4	27.1	27.9	4.89	10.5	4.29	1.97	1.7	0.918	0.959	1.33
2002	1.31	1.87	3.66	7.41	23	13.7	3.04	2.1	1.75	4.43	16	20
2003	17.3	9.54	34.2	22.6	7.85	56.4	5.39	9.73	8.06	14.5	27.4	44.3
2004	12.7	11.6	16.2	17.8	18.9	4.85	4.59	5.87	10.1	11.7	10	27.4
2005	29.2	17.7	22.2	38.3	4.7	2.93	3.95	2.02	1.36	25.4	16.5	29.2
2006	38.6	22.7	6.32	9.52	15.2	15	10.1	3.77	12.7	13.2	36.6	13.4
2007	19.8	6.68	20.9	44.8	9.15	2.39	3.22	5.64	2.36	4.78	9.81	25.7
2008	21.8	40.3	40.3	12.3	15.4	3.41	1.85	1.79	4.6	10.4	17.3	32
2009	14.2	10.2	8.2	16.5	14.5	19.4	8.47	11.3	3.95			
Mean	17	16	22	24	16	12	6.6	6.3	5.6	8	12	19

USGS 01379773 Green Pond Brook at Picatinny Arsenal NJ
Morris County, New Jersey
Hydrologic Unit Code 02030103
Latitude 40°57'36", Longitude 74°32'23" NAD83
Drainage area 7.65 square miles
Gage datum 712.54 feet above sea level NGVD29

*Figures contained in this table are approximately three times the flow rates in Green Pond Brook exiting the Gorge area.

Flow rates associated with a 10-foot high mixing zone for each of the three phases of construction (faceup, adits, chamber) were estimated for input into SESOIL to model the potential for groundwater contamination during the three phases of construction (see Appendix B). The resulting figures were based on estimated hydraulic conductivities, hydraulic gradients obtained from measured water table elevations, and cross-sectional areas of the model mixing zones. Since groundwater flow is proportional to area, the figures in the Groundwater Modeling Report were multiplied by ratios of the affected areas (i.e., the disrupted vertical cross-sectional areas plus two-foot clearances) to the corresponding mixing zone areas to obtain estimates of the maximum water disruption to Green Pond Brook. The flows associated with the two-foot clearance were estimated to be one-fifth the flows calculated in the Groundwater Modeling Report for the flow in the 10-foot mixing zone (SESOIL Model). Table 3-17 shows the calculation results.

Table 3-17. Estimated Maximum Potential Water Flow from Construction Area*

SESOIL Mixing Zone Cross-Sectional Areas (sq ft)			
Faceup	Adits	Chamber	
1000	320	900	
SESOIL Mixing Zone Flow (cu ft/day)			
Faceup	Adits	Chamber	
250	0.32	0.9	
Construction Zone Areas (sq ft)			
Faceup	Adits	Chamber	
42625	25600	31416	
Maximum Disrupted Flow			
Faceup	Adits	Chamber	
10856.3	89.6	211.4	cu ft/day
56.39	0.47	1.10	gpm
0.1257	0.0010	0.0024	cfs

*Based on conditions used in the Groundwater Modeling Report and total area exposed by construction.

The maximum calculated figure, 0.126 cfs, corresponds to hydraulic conditions that would exist when the water table is at the ground surface (i.e., all exposed area due to construction results in flow).

As displayed in Table 3-17, substantial year-to-year and month-to-month flow variations in Green Pond Brook are experienced at the inlet to Picatinny Lake. Based on these data, fluctuations in stream flow at the outlet from the Gorge area are estimated to be as high as 10 cfs, so that the potential change in stream flow due to construction would be difficult to discern against the background fluctuations that are currently experienced.

In the spring, when both the stream flow and water table elevation would be at their maximum, the estimated maximum value for water from the construction site is approximately 1.5 percent of the stream flow (= 0.12 cfs / (24/3) cfs).

Temperature

Temperatures in the Gorge area portion of Green Pond Brook vary seasonally. During the spring snowmelt, the stream is fed by melting snow. Ambient air temperatures and solar insolation vary seasonally, so that the temperature of the water draining from Green Pond varies accordingly. Groundwater that emerges from the mountain in springs for much of the year is cold since the cracks and fissures in the mountain are recharged with melted snow. Unfortunately, temperature data in this area are also sparse. Temperature data collected during the July 22, 2010, surface water survey show water temperatures ranging from 12.6°C to 20.86°C. The low temperature, recorded at a spring, indicates that the thermal mass of the mountain is effective at keeping temperatures relatively low, even in the summer months.

The temperature of Green Pond Brook depends on the blend of water coming from Green Pond and water discharging from Green Pond Mountain and Copperas Mountain Ridge. The Gorge area, located between these two mountain ranges, receives snowmelt that is temporarily stored in the mountains (Upper Bedrock Aquifer), and blends with warmer surface water.

If water is not encountered during construction, there should be no temperature impact on surface water due to construction activities. However, if water were encountered, the potential impact of the project on temperature would depend upon the quantity of groundwater diverted from its normal path, the temperature of water that is removed from the ground, if any, and if it is returned to the ground, its temperature and location of reinjection. The time of the year would affect the magnitude of the impact since the temperatures of the water from Green Pond and water from the Upper Bedrock Aquifer in the mountains flanking the Gorge change with time, as does their flow ratio.

Appendix C contains the heat balance equation and calculations performed to estimate the maximum potential temperature impact on Green Pond Brook due to the construction of the SAFER. The same upgradient groundwater flow patterns should be expected during operation of the facility, so that the calculated value of the maximum potential temperature impact during construction also represents the maximum potential impact associated with the operation of the SAFER should dewatering be required, assuming that all of the dewatering operation discharge is diverted away from Green Pond Brook.

This maximum-impact calculation indicates that there could be an increase of as much as 0.42 °C in the stream temperature due to loss of cooling from the cold spring flow originating from the construction site. This figure should be taken as an upper bound on temperature due to construction since the flow rate used corresponds to maximum flow conditions (which would only exist during spring melt) with flow coming from all exposed areas. The rest of the data used correspond to July conditions, when the water table has fallen substantially, and dewatering may not be required at the construction site. In that case, there would be no change in the water temperature. Similarly, there should be minimal to no change in water temperature during the spring snowmelt when the difference between the upstream water temperature and the spring water temperature would be small. Unfortunately, field data to document the hydraulic conditions associated with the SAFER site are not available.

pH

As with temperature, data regarding the pH of water in the Gorge area are sparse and vary with location. Data collected during the July 22, 2010, surface water survey show water pH values ranging from 4.84 to 6.65. The lowest pH value was associated with water emerging from a spring, while samples collected from Green Pond Brook accounted for the higher pH values.

The pH values of ammonium nitrate solutions were reported to range between 4.2 and 6.0, depending on the concentration and impurities in the solution. The probability of the construction impacting the pH of Green Pond Brook would be remote for the following three reasons:

- The water from construction would be greatly diluted with water flowing in the fault.
- Sampling of the water from the spring associated with the construction area (see Appendix B, Table A-1) indicates low pH values (4.84) compared to other locations in Green Pond Brook that were closer to neutral pH (6.09-6.65). A dilute solution of ammonium nitrate would be in the same pH range as the water already coming from the spring.
- Solid surfaces with which water from the construction site comes in contact would likely have a strong buffering effect that would bring any deviations from the bulk fluid pH back in line.

3.7.3 *Environmental Consequences – Water Resources*

The following two alternatives are compared in this section to highlight the environmental consequences associated with the SAFER project: No Action Alternative and Preferred Alternative. The quantitative results described in the previous section serve as the basis for the comparison. Stream sedimentation, an additional potential consequence of the project, is also discussed in more qualitative terms.

3.7.3.1 Groundwater

No Action Alternative

Under the No Action Alternative, there would be no direct or indirect impacts to groundwater.

Preferred Alternative

Construction. (Moderate Impact with Mitigations) Under "worst-case" conditions, and in the likely event that groundwater would be encountered during construction of the SAFER, groundwater in the Upper Bedrock Aquifer would potentially be impacted by ammonium and nitrate ions in the construction areas associated with the faceup area, adits, and chamber if no mitigation measures are implemented. However, with the implementation of mitigation measures, as described in the following subsection, no exceedances of relevant groundwater standards are projected.

No impact on the Lower Bedrock Aquifer is anticipated because the groundwater flow is primarily lateral to the nearby fault over which the faceup would be constructed. Upon reaching the fault, groundwater from beneath the construction area would be diluted, and contaminant concentrations would be reduced further. No human or ecological receptors would be exposed to the groundwater prior to its emergence at the perennial spring. Both ammonium and nitrate would readily flush out of the Upper Bedrock Aquifer; however, peak ammonium concentrations would be delayed slightly due to adsorption on solid surfaces.

A hydrogeologic study was conducted in 2012 to provide actual data on the presence of groundwater at the SAFER construction site, including estimated flow/volume rates (CPI, 2012b). A groundwater flow model was developed for the area using a mid-range hydraulic conductivity value determined during the pumping tests (0.009 feet per day), a relatively low estimate of local recharge (3.64 inches per year), and nearby surface water elevation measurements. The model results indicate that total drainage into the proposed chamber, faceup area, and adits will likely be less than five gallons per minute (gpm), but could reach up to 15 gpm, under observed conditions at the SAFER facility location. This drainage will include both stormwater run-off, and groundwater flowing from adjacent rock after overburden is removed via conventional excavation and bedrock is blasted. The 2012 study also shows significant change in water levels, as much as 40 feet, at the site between May and September.

Accordingly, water management may be required to allow for facility construction, and the degree of measured will depend on water levels at the time of construction. As discussed previously, significant seasonal variations have been observed with regard to depth to groundwater beneath the construction site. Thus, the amount of dewatering required to permit construction will vary over the course of the year, and may be minimized by timing construction to coincide with the drier months in late summer and early fall. A variety of engineered options for controlling water at the construction site were evaluated as part of the hydrogeologic study (CPI, 2012b). Bedrock blasting can be performed without dewatering the bedrock mass, but surface-based hydraulic controls (e.g., ditching, berming) would be needed to allow for construction of the SAFER. Use of water resistant ANFO (e.g., emulsions, watergels) is proposed to reduce potential of residual ANFO leaching to groundwater.

Mitigation. A dewatering plan for the construction period will be developed when the NEPA analysis is complete. The dewatering contractor will develop mitigation measures, possibly to include obtaining a dewatering permit. A monitoring plan will also be developed prior to initiating construction. Any concerns that arise during the course of construction or operations will be evaluated by decision-makers and addressed at that time.

Operations. (Minor Impact with Mitigations) Construction of the SAFER would include installation of an impermeable geo-liner and concrete flooring to minimize the escape of contaminants to the environment and the likelihood of impacting groundwater during operation. Implementing mitigation measures as discussed below would eliminate the migration of munitions constituents from IM testing into the groundwater below the SAFER. Not implementing the mitigation measure would equate to a potential long-term significant impact to water quality.

In addition, as discussed above, projected drainage rates into the SAFER chamber, faceup area, and adits during construction range between approximately 4 to 15 gpm (CPI, 2012b). Dewatering may need to be continued throughout SAFER operations to keep the chamber dry. The hydrogeologic study recommended a combination of stormwater run-on and infiltration controls, sumps, and grouting to minimize water entering the unit during facility operations.

Mitigation. Install a geo-liner beneath the SAFER main chamber to eliminate short and long-term migration of munitions combustion byproducts into the groundwater beneath the SAFER site. Install a concrete floor designed with drain to divert any build-up of moisture from the main chamber from transporting munitions combustion byproducts from the SAFER walls to the underlying soils. This would be an added measure of protection beyond the geo-liner, and it would add stability for equipment transporting munitions to the SAFER chamber for testing.

A dewatering plan for the operations period will be developed when the NEPA analysis is complete. The dewatering contractor will develop mitigation measures, possibly to include obtaining a dewatering permit.

Regular maintenance procedures would be instituted during facility operations (e.g., cleansing walls and floors) after significant munitions tests to minimize the potential for munitions combustion byproducts to be transported to areas (by foot or equipment traffic) not protected by the proposed geo-liner, or to outside the SAFER facility.

3.7.3.2 Surface Water

No Action Alternative

Under the No Action Alternative, there would be no impact to surface water.

Preferred Alternative

Construction. (Moderate Impact with Mitigations) No significant adverse consequences are anticipated for Green Pond Brook or downstream water bodies, based on the analyses performed and the assurance that additional measures would be taken as needed to meet the assumptions in the Groundwater Modeling Report within this EA (Appendix B). The analyses indicate that ammonia and nitrate concentration changes in Green Pond Brook would be immeasurably low; the maximum potential flow and temperature changes in the stream would be a 1.5 percent reduction in flow and 0.42°C rise in temperature, assuming all water encountered is diverted away from the stream; and no shift in the pH of the spring water associated with the site.

Short-term minor impacts are expected with respect to sedimentation or stream turbidity. As stated previously, most airborne solids from construction activities are expected to settle on the project-side of a hill that is located between the construction site and Green Pond Brook. In addition, no changes in stream chemistry that would cause precipitation of dissolved solids are foreseen, and increased use of Upper Gorge Road by heavy equipment associated with the project would occur during mobilization and demobilization, after mitigation measures are in place.

Because groundwater beneath the site eventually reaches Green Pond Brook, the same mitigation measures that would protect groundwater would also protect surface water.

Based on the Groundwater Modeling Report (Appendix B), maintaining a clearance of more than two feet would reduce the overall impact of the construction on downstream bodies of water. With the two-foot clearance, minor, immeasurable, transient increases in nitrate and ammonium ion concentrations in Green Pond Brook are projected, with the greatest increase being nitrate, which would roughly increase by half a part per billion (i.e., 0.0005 mg/L). This is less than the sensitivity of the most sensitive EPA-approved analytical method.

ARDEC sponsored a hydrogeologic study in 2012 that confirmed the presence of groundwater at the SAFER construction site, and provided estimated rates of groundwater discharge into the area (CPI, 2012b). A dewatering plan, covering both the construction and operations periods, will be developed when the NEPA analysis is complete; therefore, it is the construction contractor's responsibility to ensure that the dewatering plan is properly implemented such that there are no measurable impacts on Green Pond Brook. Accordingly, no further mitigation related to contaminant concentrations reaching Green Pond Brook should be necessary (see discussion in Section 3.7.2.2).

In addition, as stated previously, a detailed monitoring plan would be prepared for the construction project, including monitoring of the groundwater, the spring, and Green Pond Brook. It would also contain stop-work provisions. The plan would contain direction on actions to be taken in case of contingencies (e.g., encountering groundwater on the construction site, nitrate and/or ammonia concentrations exceeding water quality standards in monitoring wells).

Prior to initiating the construction phase of the project and before any heavy equipment is mobilized, silt fencing would be installed along the road where it runs adjacent to and in close proximity to Green Pond Brook to minimize sedimentation issues, including the kicking of sediments up into sedimentation ("kickout"). In addition, a stabilized construction entrance would be constructed prior to initiating the formal construction phase.

Mitigation. To prevent contact between groundwater and residual ANFO, ARDEC will make use of ANFO gels and/or emulsions. The dewatering contractor will also develop mitigation measures, possibly to include obtaining a dewatering permit. A monitoring program will also be put into place to identify any water quality changes that may be attributable to SAFER construction and/or operations.

Operations. (Minor Impact) The test facility would be a well-controlled operation where munitions are tested and proper cleanup of residual unreacted energetic material from the test chamber and adits is performed between tests. Therefore, there would be minor impacts to surface water from SAFER operations. Dewatering may need to be continued throughout SAFER operations to keep the SAFER facility dry.

The use of standard operating and maintenance procedures would be instituted to minimize the escape of contaminants to the environment and minimize the likelihood of impacting surface water directly or indirectly by groundwater during the operation of the test facility. The design of the facility includes a concrete floor and a geo-liner beneath it that would facilitate cleanup and minimize the potential for migration of contaminants to the groundwater below. Wet cleanup would be kept to a minimum and any introduction of water into the chamber must be controlled by pumping into containers or a sump. Routine inspections, repairs of cracks, and periodic re-sealing would be performed to minimize the escape of contaminants to the environment and the likelihood of impacting groundwater, which eventually reaches Green Pond Brook.

Mitigation. The dewatering contractor will develop mitigation measures, possibly to include obtaining a dewatering permit. Dewatering may need to be continued throughout SAFER operations to keep the facility dry. Although a concrete floor and geo-liner would be in place, the test facility would be kept dry to minimize potential impact to groundwater that leads to surface water. In addition, a monitoring plan would be developed to include monitoring of the groundwater, the spring, and Green Pond Brook, and to assess the effectiveness of the mitigation measures that are in place.

Rock Storage Areas (Minor Impact with Mitigations)

It is anticipated that the majority of the unreacted ANFO would be removed from the construction site and taken to the rock storage areas; therefore, zero percent to 4 percent of the total ANFO used during construction may potentially remain as unreacted residue on the rock to be transported to this location. It is anticipated that the unreacted ANFO residue (if any) would not pose a problem or have significant impact on surface water or groundwater due to site-specific characteristics, such as ample presence of vegetation and depth to groundwater.

A rock feasibility study will be conducted, and is anticipated to validate the need for mitigation at the rock storage areas. At that time, collection of core samples and characterization of the sites (including the measurement of groundwater elevations) will permit modeling of the sites, if necessary. Similarly, a detailed assessment of the ground surface characteristics will permit the uptake of ammonium nitrate from surface runoff to be estimated. Residual ANFO on blasted rock will also be determined. With this additional information, issues regarding the need for mitigation measures will be determined. Measures to be used at the project site and rock storage areas will be specified in permitting plans to be approved by NJDEP and the Morris County Soil Conservation District.

Mitigation. The mining contractor would be required to demonstrate and provide evidence that its methodology is at least 96 percent effective for consuming residual ANFO during blasting. If required, the mining contractor would develop mitigation measures for any remaining residual ANFO on the rock to be transported to the rock storage areas. Current possible mitigation measures are described in the report entitled, *Erosion and Sediment Control and Stormwater Management Evaluation* (Booz Allen, 2011). Three categories of mitigation measures are presented: General, Rock Storage Areas, and Roadway. Mitigation measures in the rock storage areas focus on erosion control.

Stream Sedimentation (Minor Impact with Mitigation)

During construction, the potential for stream sedimentation in the vicinity of the project and at locations where the Upper Gorge Road nears Green Pond Brook depends on numerous factors, including the quantity of material that would be airborne during site excavation activities, possible increased traffic, and road conditions. Because there is a hill between the project site and Green Pond Brook, virtually all of the airborne material is expected to deposit on the project-side of the hill. The use of the road by heavy equipment would likely be restricted to the mobilization and demobilization phases of the project. Operation of the SAFER would result in reduced airborne solids during the testing of munitions. Most would be contained within the facility and removed during facility maintenance activities.

Mitigation. During construction, silt fencing (with passage points for wildlife) is recommended for keeping solids (including minor “kickout”) from entering Green Pond Brook. The silt fencing would be in place prior to mobilization of heavy equipment. It is not anticipated that high vehicular traffic would occur along Green Pond Brook; however, if necessary, employ the use of a water truck along the unpaved portion of Upper Gorge Road, adjacent to the Brook. Keeping the gravel surface moist would keep excess sediment from entering the stream. Application of excessive quantities of water would be avoided. Measures to be used at the project site would be specified in permitting plans to be approved by NJDEP and the Morris County Soil Conservation District.

3.8 Wetlands

3.8.1 *Affected Environment – Wetlands*

Wetlands at Picatinny Arsenal are mainly composed of muck and peat formed from glacial soils. Based on previous studies and National Wetland Inventory maps, there are an estimated 1,250 acres of wetlands at Picatinny Arsenal. These areas include freshwater marshes and freshwater swamps. Most of the wet areas are located in the Green Pond Brook flood plain at the southern end of the installation. This area has been highly disturbed in the past with its southernmost portion of Green Pond Brook running through floodplain wetlands that were drained by a series of constructed drainage ditches. This segment of Green Pond Brook was channeled by dredging in 1944. These areas also contain a network of upland areas that were created from fill material. The upland areas provided sites for buildings, railroad beds, roadways, parking areas, and work areas. A second major flood plain wetland is located in the vicinity of Burnt Meadow Brook, north of Lake Denmark. Other smaller wet areas occur as narrow fringes along lakes, streams, and seepages.

Wetlands specific to the proposed SAFER area are located along Green Pond Brook, along the northern side of 4th Avenue, and on the eastern side of the proposed project area. These areas are comprised of an assortment of broad-leaved deciduous and needle-leaved evergreen trees that dominate the wetlands and small emergent areas. Delineated wetland areas also have associated transition areas adjacent to an unnamed tributary to Green Pond Brook. Wetland areas identified primarily include the following types:

- **Palustrine Forested Wetlands:** Forested wetland communities were delineated adjacent to Green Pond Brook, on top of the hill, and along the roadway. Dominant hydrophytic vegetation included grey birch **(***Betula populifolia*) and eastern hemlock *(Tsuga canadensis)* with mountain laurel *(Kalmia latifolia)* and red-osier dogwood *(Cornus sericea)* in the shrub layer. Common herbaceous species include Japanese stiltgrass *(Microstegium vimineum)* and Sphagnum species.
- **Emergent Wetlands:** An emergent wetland community was delineated along 4th Avenue. Common species identified include Japanese stiltgrass, daisy fleabane *(Erigeron strigosus)*, soft rush *(Juncus effusus)*, and woolgrass *(Scirpus cyperinus).*

Wetlands also provide critical habitats for many threatened and endangered species. Picatinny Arsenal contains an array of habitat area, and subsequently contains an array of wildlife including birds, mammals, reptiles, fish, and insects. The variety of forested, riparian, wetland, shrub, and mountainous habitat have led to a biodiversity level at Picatinny that is above-average in comparison to the rest of North Central New Jersey (Picatinny Arsenal, 2001).

The installation is home to over 300 species of vertebrates, including 41 mammal species, 26 fish species, 21 amphibian species, 19 reptile species, and over 200 bird species (Picatinny Arsenal, 2001). There are also more than 300 invertebrate species found at Picatinny, the most common of which are in the Odonata and Lepidoptera families, including dragonflies, damselflies, butterflies, and moths (Picatinny Arsenal, 2001). Green Pond Brook is classified as a trout-production waterway, and has a potential likely habitat for threatened and endangered species.

The New Jersey Natural Heritage Program (NHP) provided information on known or potential occurrences of threatened or endangered species within or adjacent to the project area. Cool water fish species and warm water fish species are found at Picatinny. The main fishing species include largemouth bass, chain pickerel, northern pike, crappie, yellow perch, catfish, and sunfish. Picatinny's Upper Green Pond Brook and other cold water streams house the native brook trout (*Salvelinus fontinalis*), a State-listed Species of Concern. As part of an application for an NJDEP Individual Area Transition Waiver (RBA, 2011), the waiver identified a list of threatened or endangered species known to occur within or adjacent to the SAFER project area. The lists of species are included in Section 3.9.

3.8.2 *Environmental Consequences – Wetlands*

No Action Alternative

No impacts to wetlands are anticipated under the No Action Alternative. Any pre-existing impacts due past and current projects or their cumulative influence would be expected to continue.

Preferred Alternative

Construction. (Moderate Impact) Potential impacts to wetland areas from the SAFER construction phase would be moderate due to the presence of wetlands within the 150-foot transition area and the high potential for T&E species (see Section 3.9). Construction and the associated disturbances within wetland transitional zones may require NJDEP wetland permitting and/or compensatory mitigation. The wetlands in close proximity to the proposed SAFER site may be considered as having an exceptional resource value by USFWS based upon documentation of endangered and threatened species. An exceptional resource value wetland has a 150 feet transition area from the delineated boundary of the wetland. It is estimated that a total of 0.04 acres of transition areas would be impacted (refer to Figure 2-3). The State of New Jersey's compensatory mitigation program operates on a 1:1 ratio (one acre of mitigation per acre disturbed). Section IX of the permit application, the "compensatory mitigation," proposes to "plant four indigenous species within 0.04 acres of the currently disturbed transition area." ARDEC estimates it will require 1 to 2 days to plant, and that the effort would require replacement "plugs" to be placed 6 to 12 inches in the ground. Unexploded ordnance (UXO) support by qualified explosive ordnance disposal (EOD) technicians would be required, given the historical context of munitions testing in the area.

Operations. (Minor Impact) Operating the SAFER would have a minor direct impact on wetland areas within the vicinity of the SAFER. Compared to previous operating conditions associated with munitions testing (open air), the SAFER operating conditions (enclosed chamber) would likely have a positive impact on both wetlands and critical habitats with improved water quality, for example. Design considerations were modified in an effort to account for the geological, topographic and security restrictions of the proposed project. Design modifications aimed to avoid impacting surrounding wetlands and associated transition areas. Planned activities would also minimize any further impact by using an industrial generator as the primary power supply for this facility during construction.

3.9 Biological Resources

3.9.1 *Affected Environment – Biological Resources*

3.9.1.1 Vegetation

Picatinny Arsenal is approximately 70 percent forested and is classified as being within the New Jersey Highlands Region. The Picatinny Arsenal INRMP includes a comprehensive inventory of known plant species found on the installation (Picatinny Arsenal, 2001). Of Picatinny's nearly 4,100 acres of forest, mixed oak is the most prevalent forest type, comprising 65 percent of the total forested area at Picatinny (Picatinny Arsenal, 2001).

The potential SAFER site was surveyed along both the bottom and the top of the ridge in July 2010 by RBA. RBA took soil samples and compiledvegetation data, and checked for indicators of hydrology. The soils samples did not include any hydric indicators and there was no evidence of hydrology. Most of the vegetation included facultative and upland species (RBA, 2011).

RBA characterized the plant community at the base of the ridge as "mixed upland woodland," primarily composed of eastern hemlock (*Tsuga canadensis*) and chestnut oak (*Quercus prinus*), with a few red maple (*Acer rubrum*) trees. The understory included mountain laurel (*Kalmia* *latifolia*), witch hazel (*Hamamelis virginiana*), and seedlings of the tree species noted above (RBA, 2011).

RBA characterized the plant community on the top of the ridge as "scrub/shrub upland," with a few hemlocks and chestnut oaks. RBA notes that mountain laurel grows in clumps and small black huckleberry (*Gaylussacia baccata*) is dominant in the understory in this area.

The Picatinny Natural Resources Manager also visited the proposed SAFER site in July and November 2010 and noted that, "The site is dominated by upland Mixed Oak species (mainly Chestnut Oak) interspersed with Black Birch [*Betula lenta*] and a few Eastern Hemlock trees" (Van De Venter, 2010 and 2011a).

There are no Federally-listed threatened or endangered plant species at Picatinny, but there are seven verified State-listed engendered plants and 14 State species of concern. Ten other State species of concern are thought to exist at Picatinny, though their presence has not yet been verified (Picatinny Arsenal, 2001). No State-listed plant species are known to occur in the vicinity of the proposed SAFER site specifically (see more detailed discussion in Section 3.9.1.3).

Many non-native and noxious plant species are found at Picatinny. Though the entire installation has not been surveyed for invasive species, those identified include: common reed (*Phragmites australis*), Japanese knotweed (*Polygonum cispidatum*), garlic mustard (*Brasica rapa*), multiflora rose (*Rosa multiflora*), autumn olive (*Elaeagnus angustifolia*), Japanese barberry (*Berberis thunbergii*), Japanese honeysuckle (*Lonicera japonica*), purple loosestrife (*Lythrum salicaria*), Canada thistle (*Cirsium arvense*), and water milfoil (*Myriophyllum spp*) (Picatinny Arsenal, 2001). None of these species was listed among the dominant plant species identified in a recent survey of the proposed SAFER site (RBA, 2011).

3.9.1.2 Fish and Wildlife

Picatinny Arsenal contains an array of habitat area, and subsequently contains an array of wildlife including birds, mammals, reptiles, fish, and insects. The variety of forested, riparian, wetland, shrub, and mountainous habitat have led to a biodiversity level at Picatinny that is above-average in comparison to the rest of North Central New Jersey (Picatinny Arsenal, 2001).

The installation is home to over 300 species of vertebrates, including 41 mammal species, 26 fish species, 21 amphibian species, 19 reptile species, and over 200 bird species (Picatinny Arsenal, 2001). There are also more than 300 invertebrate species found at Picatinny, the most common of which are in the Odonata and Lepidoptera families, including dragonflies, damselflies, butterflies, and moths (Picatinny Arsenal, 2001). A comprehensive listing of all fauna observed at the installation is included in the INRMP (Picatinny Arsenal, 2001). Unless otherwise noted, the INRMP is the source of information included throughout this section.

Mammals

Mammals found at Picatinny include squirrels, mice, voles, moles, shrews, bats, rabbits, opossum, woodchucks, foxes, raccoons, deer, bobcats, and black bears. The installation serves as a corridor between black bears' winter hibernation and summer foraging habitats, and black bears have become a seasonal nuisance at Picatinny. The larger mammal species subsist on vegetation and small mammals. Rodents and other small mammals also serve as prey for the installation's amphibian and reptile populations.

There are seven bat species at Picatinny, including one Federally-listed endangered bat species (i.e., the Indiana bat, *Myotis sodalis*) and the little brown bat (*Myotis lucifugus*), which is the most common bat species found at the installation.

Birds

Over 200 species of birds are known at Picatinny, but almost half are migrant species that only pass through the installation during spring and fall migrations. Thirty-nine of the bird species at Picatinny are considered permanent residents and 71 species are seasonal residents. The variety in the avian population found at Picatinny requires a diverse range of habitat areas to satisfy the various birds' foraging needs. The installation must maintain the current diversity level in its habitat areas to support diversity in its migrant and permanent bird population.

During the spring breeding season, 103 species are present at the installation; of those, 65 species are confirmed to breed at Picatinny and another 15 species probably breed there as well. There are five State-listed threatened and endangered bird species at Picatinny that are known to use the installation for breeding, foraging and residence. There are another 13 State-listed threatened and endangered bird species, but these species are only seen as transient to the installation area, occurring during seasonal migrations. One of these State-listed species is a "critically imperiled" waterbird. There are also two Federally-listed Species of Concern at Picatinny. Federal and State-listed species that may be present specifically in the vicinity of the proposed SAFER site are identified in Section 3.9.1.3.

Picatinny maintains populations of numerous waterfowl and game bird species, including ring-necked pheasants, which are stocked annually.

The Picatinny INRMP identifies the following management actions for the protection of birds:

- Maintain large forested tracts to the extent possible.
- Avoid further fragmentation of the forest when planning future facilities.
- Reduce or mitigate edge effects where possible in those areas that may be identified as important breeding or nesting habitats.
- Maintain sufficient snags for cavity nesters

Fish, Reptiles, and Amphibians

Cool water fish species and warm water fish species are found at Picatinny. The main fishing species include largemouth bass, chain pickerel, Northern pike, crappie, yellow perch, catfish and sunfish. Picatinny's Upper Green Pond Brook and other cold water streams house the native brook trout (*Salvelinus fontinalis*), a State-listed Species of Concern. Green Pond Brook runs to the west of the potential SAFER site, connecting Green Pond to Lake Denmark and Picatinny Lake (see Figure 3-6).

There are a number of common reptiles and amphibians at Picatinny, including bullfrogs, green frogs, American toads, snapping turtles, black rat snakes, garter snakes, northern copperheads, and red spotted newts. Although a biological survey was not conducted, Booz Allen personnel noted large numbers of leopard frogs during a water quality survey on July 22, 2010 (sampling locations are shown on Figure 3-6).

3.9.1.3 Threatened and Endangered Species and Species of Concern

Picatinny is home to more than 80 threatened, endangered, and special concern plant and animal species listed by the State of New Jersey and Federal Government. Some of these species live and breed at Picatinny, while many are transient species observed at the installation only during seasonal migrations. There are also a number of State-listed species whose presence at Picatinny has not been verified, though the installation lies within their known habitat ranges.

There are two Federally-listed species at Picatinny, the endangered Indiana bat (*Myotis sodalis*) and the threatened bog turtle (*Clemmys muhlenbergii*) (Picatinny Arsenal, 2001).

To prepare an application for an NJDEP Individual Area Transition Waiver (RBA, 2011), RBA contacted the NJ NHP regarding known or potential occurrences of threatened or endangered species within or adjacent to the SAFER project area. The list of species provided by NJ. NHP in response to this inquiry is given in Table 3-18.

Table 3-18. Species of Concern That May Occur within the Project Limits per NJ NHP (reproduced from The RBA Group, 2011)

Common Name	Scientific Name	Federal Status	State Status*
Barred Owl	*Strix varia*		T/T
Bobcat	*Lynx rufus*		E
Cooper's Hawk	*Accipiter cooperii*		T/T
Eastern Small-Footed Myotis	*Myotis leibii*		SC
Golden-Winged Warbler	*Vermivora chrysoptera*		SC
Indiana Bat	*Myotis sodalis*	LE	E
Northern Copperhead Snake	*Agkistrondon contortrix contortrix*		SC
Northern Goshawk	*Accipiter gentilis*		E/SC
Red-Headed Woodpecker	*Melanerpes erythrocephalus*		T/T
Red-Shouldered Hawk	*Buteo lineatus*		E/T
Timber Rattlesnake	*Crotalus horridus horridus*		E
Wood Turtle	*Clemmys insculpta*		T

*Breeding status/non-breeding status is indicated for birds.
LE = listed endangered, T = threatened, E = endangered, SC = species of Special Concern

The NHP also reported potential habitat within the SAFER site for the following species: bald eagle *(Haliaeetus leucocephalus)*, State-endangered; bog turtle *(Clemmys muhlenbergii)*, State-endangered and Federally-listed; longtail salamander *(Eurycea longicauda longicauda)*, State-threatened; as well as New England bluet *(Enallagma laterale)*, ski-tailed emerald *(Somatochlora elongate)*, spatterdock darner *(Rhionaechna mutate)*, veery *(Catharus* *juscescens),* and Williamson's emerald *(Somatochlora williamsoni),* which are all species of special concern (RBA, 2011).

The NHP reported that the project area was located within the Natural Heritage Priority Site of Lake Denmark, which has a biodiversity rank of B4V1 (RBA, 2011).[16] Also, the Picatinny INRMP notes the possible presence of the following New Jersey species of concern in the northern portion of the installation and/or in upland areas more generally: Allegheny vine (*Adlumia fungosa*), mountain spleenwart (*Asplenium montanum*), purple virgin's bower (*Clematis occidentals),* Virginia snakeroot *(Aristolochia serpentaria*), wood lily *(Lilium philadelphicum*), stiff clubmoss (*Lycopodium annotinum*), and tall cinquefoil (*Potentilla arguta)* (Picatinny Arsenal, 2001). It is unknown whether any of these species currently occurs at the SAFER site.

In addition to the species listed in Table 3-18, NJDEP (2012a) noted that the eastern box turtle (*Terrapene carolina carolina*) is a New Jersey species of special concern that may occur in the vicinity of the SAFER site.

The Picatinny INRMP notes that the most recent sighting of a wood turtle on the installation was documented in June 1999 (Picatinny Arsenal, 2001). Two subsequent sightings of wood turtles in the Gorge near Green Pond Brook were reported to the State of New Jersey in 2003 and 2011. The barred owl resides and breeds at Picatinny, and the northern goshawk nests and forages sporadically on the installation (Picatinny Arsenal, 2001). The remaining State-listed bird species use a variety of installation habitats during seasonal migrations (Picatinny Arsenal, 2001).

Based on recommendations made by the Picatinny Arsenal Natural Resources Manager (Van De Venter, 2010), the Indiana bat, timber rattlesnake, northern copperhead, and brook trout are all discussed in more detail in the sections that follow. Potential environmental consequences to these species and mitigations are discussed in Section 3.9.2, Environmental Consequences – Biological Resources. The bog turtle is also briefly discussed below, primarily to document the rationale for excluding it from more detailed evaluation.

Indiana Bat

Indiana bats (*Myotis sodalis*) occur throughout the Midwest and Eastern United States, breeding and hibernating in 26 states, including New Jersey. Although USFWS has not designated any critical habitat for the Indiana bat in New Jersey (USFWS, 2007a), there are three known sites where the Indiana bat hibernates over the winter (i.e., hibernacula) in New Jersey. Two of these sites are vertical shafts found at the Mt. Hope Mine, located 0.25 mile east of Picatinny from the Mt. Hope Gate. The third location is the Hibernia Mine, which is approximately 1.5 miles from the eastern edge of installation property (Picatinny Arsenal, 2007b). The nearest Indiana bat hibernacula are at least 2.7 miles from the proposed SAFER site (Figure 3-4).

According to the *Picatinny Arsenal Indiana Bat Endangered Species Management Plan (ESMP),* previous studies have shown that the area within a 5-mile radius of Indiana bat hibernacula serves as important foraging habitat. The proximity of the Mt. Hope Mine and Hibernia Mine

[16] Natural Heritage Priority Sites are areas identified by NJDEP as being the best remaining habitat for rare species and rare ecological communities in the state. The biodiversity rank of B4V1 indicates that the site's biodiversity is of moderate significance on a global level (B4) and outstanding significance on a state level (V1).

hibernacula to Picatinny Arsenal, all of which is within a 5-mile radius of at least one of these hibernacula,[17] means that the installation likely provides foraging and roosting habitat for the Indiana bat, before and after hibernation (Picatinny Arsenal, 2007b).

Indiana bats forage on insects, including moths, flies, caddisflies, stoneflies, bees, wasps, and beetles. Caddisflies, stoneflies, and mayflies, which are also eaten by the Indiana bat, are aquatic during their larval life stages and are present in the streams and brooks at Picatinny. These species are highly sensitive to aquatic pollution; therefore, the water quality at the installation directly relates to the quality of the foraging habitat for the Indiana bat (Picatinny Arsenal, 2007b).

Indiana bats hunt insects in closed canopy riparian woodlands or upland forests around the crowns of large stream-lining trees. Preferred streams are those of width between 10 and 70 feet, with trees overhanging the streams by at least 10 feet. Female Indiana bats roost in dead, dying, or hollow trees in areas with large trees and closed canopies in riparian areas and forest floodplains. Cutting down dead or dying trees destroys potential Indiana bat roosting habitat (Picatinny Arsenal, 2001 and 2007b).

No roosting colonies have been identified at Picatinny to date, but the verified presence of male Indiana bats during the summer roosting season and one nursing female Indiana bat indicates that there may be roosting colonies on installation land (Picatinny Arsenal, 2007b).

A tree survey of the 2-acre SAFER construction site was conducted in November 2010, and minimal dead limbs or trees that might afford summer roosting potential were observed (Van De Venter, 2011a). A second tree survey of the 5-acre rock storage areas was conducted in September 2011, and no potential roost trees were identified (Van De Venter, 2011b). Based on the November 2010 and September 2011 tree surveys, it appears unlikely Indiana bats roost at the SAFER construction site or rock storage areas. See Section 2.3.3.1, Figure 2-3, for a map of the proposed SAFER site and rock storage areas (Area A and Area B).

[17] The Indiana Bat ESMP (Picatinny Arsenal, 2007b) identifies the following management prescription associated with the 5-mile radius of influence around hibernacula: "Support and encourage similar stewardship actions and cooperative efforts by other public land managers outside the installation, especially those within a 5-mile radius of known hibernacula." Other management prescriptions are specifically identified for the 0.75-mile zone of concern.

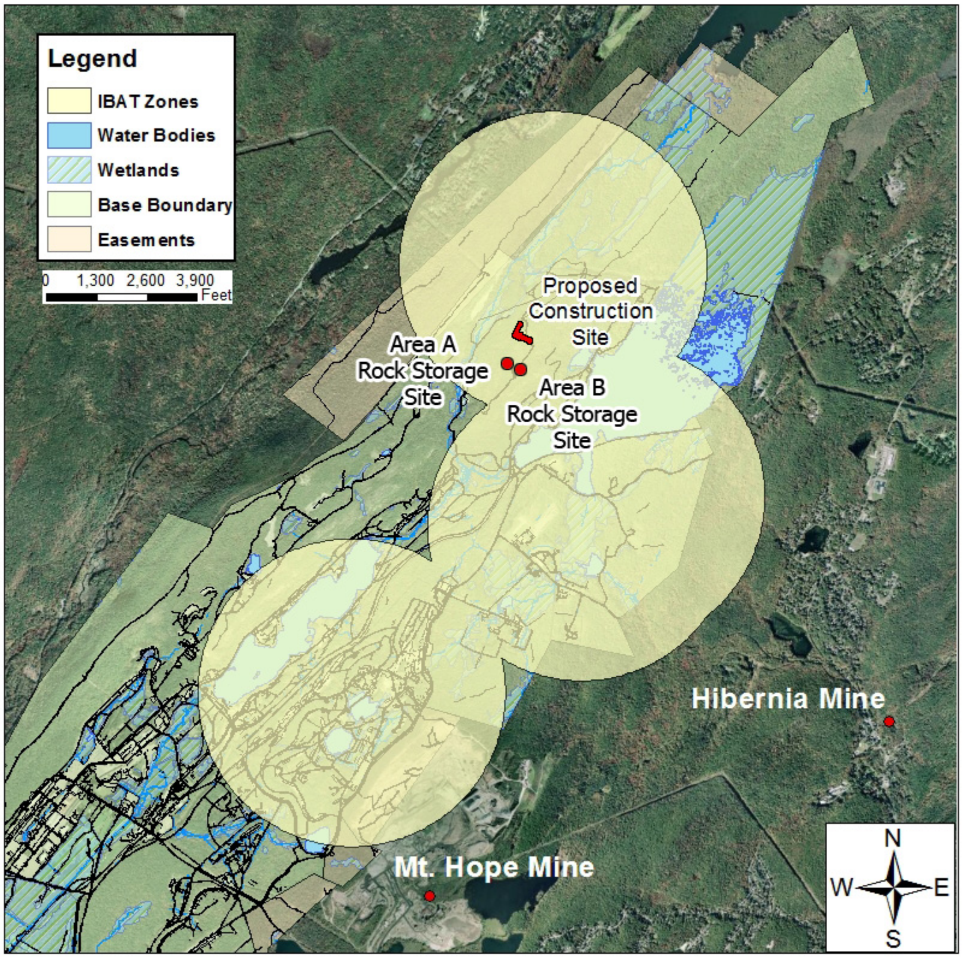

Figure 3-4. Capture/Roost Locations of Indiana Bat (IBAT)
0.75-mile Radius Zones of Concern
(The Hibernia Mine and Mt. Hope Mine Hibernacula and the Proposed SAFER Site)
Note: Map adapted from Figure 5 of the Indiana Bat ESMP (Picatinny Arsenal, 2007b)

The Indiana Bat ESMP established a number of conservation goals for the species, including: (1) identify and conserve existing foraging and roosting habitat at Picatinny, and (2) communicate with USFWS regarding the status of the Indiana bat at Picatinny (Picatinny Arsenal, 2007b). Primary management requirements in compliance with these conservation goals include:

- Restrict/prohibit tree cutting during active Indiana bat roosting season (1 April – 15 November), and ensure that any tree cutting complies with the guidelines specified in the Indiana Bat ESMP
- Protect identified roost trees and structures (e.g., caves, mines, abandoned buildings) and create 0.75-mile radius zones of concern around previous Indiana bat capture or identified roost sites
- Consult with USFWS for any tree cutting within the 0.75-mile zones of concern or during the roosting season (1 April – 15 November)

- Maintain all shagbark hickory, sugar maple, and white oak trees, as well as mature Black Locust trees, within 0.75-mile zones of concern
- Maintain at least three live trees per acre with a diameter at breast height (dbh) greater than 20 inches, and six live trees per acre with a dbh greater than 10 inches, within 0.75-mile zones of concern
- Maintain snags (trees with less than 10 percent live canopy) at least 10 feet tall with dbh of 6 inches or more within 0.75-mile zones of concern
- Minimize incremental or cumulative permanent loss of standing forest cover up to 7 percent or approximately 280 acres with up to 40 acres in riparian corridors
- Maintain canopy cover at 60 percent or more evaluated on an average stand basis
- Preserve forest cover along riparian corridors, defined as natural cover within the jurisdictional wetland associated with a perennial or intermittent stream, plus a 150-foot transition zone
- Closely regulate development in riparian areas to protect water quality
- Comply with the Integrated Pesticide Management Plant requirements for pesticide use.

The proposed SAFER location falls within 0.75 mile of a previous Indiana bat sighting (Figure 3-4), and therefore would comply with the development and tree cutting requirements in 0.75-mile Indiana bat zones of concern.

Bobcat

Per the Picatinny INRMP, the bobcat (*Lynx rufus*) is known to reside and breed on the Arsenal (Picatinny Arsenal, 2001). Scent post surveys documented bobcat tracks in the vicinity of the SAFER site in the mid-1990s. The Gorge area provides suitable habitat for the bobcat.

Bog Turtle

The bog turtle (*Clemmys muhlenbergii*), has not been sighted at Picatinny since 1987, and its current ESMP calls for only passive habitat protection in the lower Green Pond area. This remote shrub-swamp area may be a potential bog turtle habitat; although a 2000 survey did not identify any bog turtles currently living in this area (Picatinny Arsenal, 2004). The Bog Turtle ESMP has been approved by USFWS and the New Jersey Division of Fish & Wildlife (NJDFW).

As shown in Figure 3-5, the potential bog turtle habitat depicted in the Bog Turtle ESMP (Picatinny Arsenal, 2004) is more than 3,000 feet northeast of the proposed SAFER site. For this reason, impacts to the bog turtle are not anticipated and this species is not discussed in detail. As a note, The Lake End

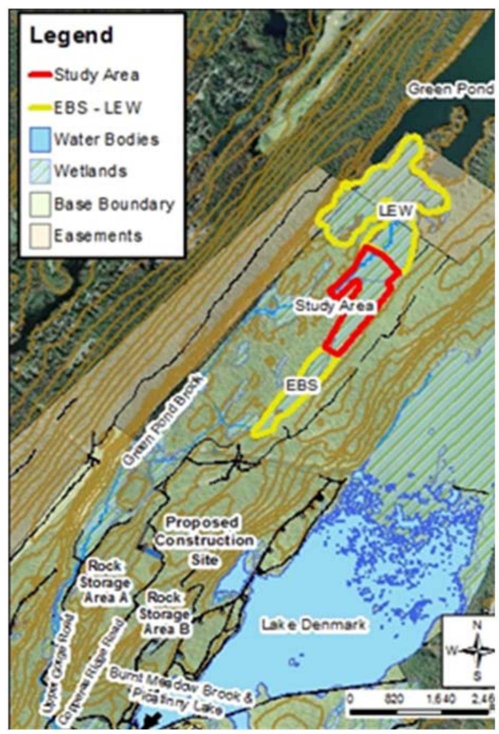

Figure 3-5. Locations of Bog Turtle Management Areas and the Proposed SAFER Site

Note: Map adapted from the Bog Turtle ESMP (Picatinny Arsenal, 2004).

Wetlands (LEW), Study Area, and East Branch Green Pond Brook Swamp (EBS), as delineated on the figure, represent bog turtle habitat and/or areas targeted for possible future bog turtle restoration efforts.

Timber Rattlesnake

Timber rattlesnakes (*Crotalus horridus horridus*) live primarily in deciduous upland forest areas. Habitat needs for the timber rattlesnake depend on the sex of the species and the time of year. Timber rattlesnakes prefer more heavily forested areas in the summer, with up to about 75 percent vegetative cover, while pregnant females prefer areas that have less canopy cover (NJDFW, 2010). They typically feed on small mammals, but also eat birds, bird eggs, and other small animals (NatureServe, 2010). Timber rattlesnakes often hibernate communally, normally in groups of less than 60 individuals (NatureServe, 2010). Dens, or hibernacula, usually occur in rocky areas that are slightly-to-moderately wooded (NJDFW, 2010).

Timber rattlesnakes migrate seasonally between winter dens and summer habitat. Timber rattlers in New York have been observed entering hibernacula during mid-September and October, and emerging during mid-May (NatureServe, 2010). NJDEP ENSP survey protocols indicate timber rattlesnakes typically emerge during mid-April through mid-May in northern New Jersey (NJDEP, 2011a). Radio-telemetry data for populations in New Jersey and Connecticut suggest that timber rattlesnakes typically move no more than 3.6 km from hibernacula (NatureServe, 2010).

The Picatinny INRMP's management recommendations for the timber rattlesnake include the establishment of 1-mile radius zones of concern around hibernacula; however these recommendations are "contingent upon available resources or supplemental funding" (Picatinny Arsenal, 2001). The INRMP further states that, if timber rattlesnakes are encountered during construction or operations, trained handlers must respond and relocate the snake(s) because the timber rattlesnake is a State-protected species. Timber rattlesnakes must not be killed or molested.

Although the Picatinny INRMP does not require specific surveys for State-listed species prior to ground disturbing activities, surveys were conducted to address NJDEP and other stakeholder concerns regarding State-listed snakes. A series of surveys for timber rattlesnakes and Northern copperheads was conducted during August 2011 through August 2012. Areas surveyed included the SAFER construction site, Rock Storage Area A, Rock Storage Area B, and a 200-meter buffer around all three of these areas. Survey methods, results, and recommendations are provided in two survey reports (NJDEP, 2011b; E2PM, 2012). The 2012 hibernacula/emergence and gestation/birthing area surveys were conducted in accordance with NJDEP protocols (NJDEP, 2011c). NJDEP has not yet published a protocol for early basking surveys. The following is a brief summary of the survey results for timber rattlesnakes.

- *Gestation/Birthing Area Survey, August-September 2011.* A single timber rattlesnake was observed foraging within the ravine that is the proposed area for the driveway to the SAFER site (NJDEP 2011b). A birthing area with at least two post-partum females and eight neonates was observed approximately 75 meters east of Rock Storage Area B. One of the post-partum females was tracked using a radio-telemetric transmitter during 23 August to early September, 2011. The female remained at the birthing site for at least a week after the transmitter was attached. By 6 September, the female had moved approximately 135 meters in a northeasterly direction along the slope and then approximately 45 meters down slope (NJDEP, 2011b).

- *Hibernacula/Emergence and Adjacent Basking Survey, April-May 2012*. East and within 200 meters of Rock Storage Area B, one small adult was observed basking and a partial skeleton was found. South and within 200 meters of Rock Storage Area B, a rattle was heard from under a rock (E2PM, 2012).
- *Early Basking Survey, June 2012*. One timber rattlesnake shed skin was found in an area east (within 200 meters) of Rock Storage Area B (E2PM, 2012).
- *Gestation/Birthing Area Survey, August 2012*. Two adult timber rattlesnakes were observed east of Rock Storage Area B, under the same birthing rock that was identified in 2011. No neonates were observed (E2PM, 2012).

The 2012 survey report concluded that the habitat located south and east of Rock Storage Area B, corresponding to the top and east-facing slope of the southern end of Copperas Ridge, represents the habitat most used by the timber rattlesnake (E2PM, 2012).

Northern Copperhead Snake

The Northern copperhead snake *(Agkistrondon contortrix contortrix)* lives in a variety of habitats and often uses rock outcrops for cover, feeding and as entrance ways to underground hibernacula (Shiels, 2010). Copperheads can also often be found in wood, rock, and brush piles created by human activities. In Pennsylvania, copperheads can be active from mid-April to late October, and eat small mammals, reptiles, amphibians and insects. During warmer months, copperheads use upland, wetland and riparian habitats, and may become nocturnal in very hot weather (Shiels, 2010).

As discussed for the timber rattlesnake, during August 2011 through August 2012, a series of surveys for timber rattlesnakes and Northern copperheads was conducted. Survey methods, results, and recommendations are provided in two survey reports (NJDEP, 2011b; E2PM, 2012). The following is a brief summary of the survey results for northern copperheads.

- *Gestation/Birthing Area Survey, August-September 2011*. No northern copperheads were observed (NJDEP, 2011b).
- *Hibernacula/Emergence and Adjacent Basking Survey, April-May 2012*. No northern copperheads were observed (E2PM, 2012).
- *Early Basking Survey, June 2012*. One adult copperhead was observed basking in an area east (within 200 m) of Rock Storage Area B (E2PM, 2012).
- *Gestation/Birthing Area Survey, August 2012*. One adult female and one adult male (probably a mating pair) were observed coiled beside each other in an area east (within 200 m) of Rock Storage Area B (E2PM, 2012).

The 2012 survey report concluded that the habitat located south and east of Rock Storage Area B, corresponding to the top and east-facing slope of the southern end of Copperas Ridge, represents the habitat most used by the northern copperhead (E2PM, 2012).

The INRMP states that, if copperheads are encountered during construction or operations, trained handlers must respond and relocate the snake(s) because the copperhead is a State-protected species. Copperheads must not be killed or molested.

Brook Trout

In August 1987, a 600-foot reach of Green Pond Brook at Picatinny was electrofished. Three young-of-the-year (YOY) brook trout and seven juvenile/adult brook trout (*Salvelinus fontinalis*) were captured (personal communication on October 15, 2010 with Mark Boriek of NJDFW). As a result of these findings, the State of New Jersey designated the stretch of Green Pond Brook from the Green Pond outlet to, but not including, Picatinny Lake as a trout production stream (i.e., "FW2-TP") (NJAC 7:9B). In August 2012, NJDFW conducted electrofishing in Green Pond Brook at Picatinny Arsenal, and 14 YOY brook trout were collected. Five additional YOY brook trout were observed, but evaded capture. No other fish were collected (Boriek, 2012).

The Picatinny INRMP (Picatinny Arsenal, 2001) notes that a self-sustaining population of brook trout exists in the headwaters of Upper Green Pond Brook and is considered to be a remnant of the original brook trout in the region. Brook trout can inhabit streams or lakes, and require water with low temperatures and high oxygen content. Brook trout mature at about two years of age and spawn in the fall. Young trout feed primarily on insect larvae, while older trout eat insects, worms, crustaceans, and small fish. Characteristics such as water quality, turbidity, sedimentation, water temperature, and woody debris are critical to trout production and maintenance (Picatinny Arsenal, 2001).

As discussed in Section 3.7, Booz Allen performed limited surface water sampling in Green Pond Brook on July 22, 2010. This survey did not include any electrofishing or other survey methods to sample fish or invertebrates. Booz Allen noted that above-ground flow in the surveyed reach was intermittent. Additionally, surface water temperatures ranged from 12.6°C to 20.86°C during this July 2010 survey.

New Jersey (NJAC 7:9B) has adopted the following temperature criteria for trout production waters: "Temperatures shall not exceed a daily maximum of 22 degrees Celsius or rolling seven-day average of the daily maximum of 19 degrees Celsius, unless due to natural conditions."

The highest temperature recorded on July 22, 2010 (20.86°C), exceeded New Jersey's rolling average temperature criterion of 19°C, and was close to the daily maximum temperature criterion of 22°C. Because continuous temperature monitoring was not conducted, it is unknown how high the actual daily maxima or seven-day rolling average of daily maxima may have been, but data collected on July 22, 2010, suggest that temperatures at some locations in Green Pond Brook during July 2010 may have exceeded NJ temperature criteria. These in-stream temperatures, coupled with observations of intermittent above-ground flow, suggest that conditions in Green Pond Brook in the vicinity of the proposed SAFER may currently be suboptimal for trout production.

The Picatinny INRMP identifies the following objectives for brook trout: (1) maintain or enhance production of brook trout in Upper Green Pond Brook and establish a stable population, and (2) restore production of brook trout in Middle Green Pond Brook (Picatinny Arsenal, 2001). To achieve these goals, the INRMP identifies the following standards and guidelines (Picatinny Arsenal, 2001):

- Identify and attempt to secure in-stream flows needed to maintain riparian resources, channel conditions, aquatic habitat, and fish passage

- Manage streams to maintain high aquatic habitat complexity, stable stream flows, and channel stability
- Maintain cover and aquatic habitat complexity through in-channel woody debris, substrate, undercut banks, overhanging vegetation, and pools
- Do not exceed summer maximum water temperatures in streams being rehabilitated to provide brook trout habitat
- Meet the minimum standard for spawning substrate in brook trout streams and streams being rehabilitated to provide brook trout habitat.

The potential for the construction and operation of the SAFER to impact the conditions that influence the survival and reproduction of brook trout is discussed in Section 3.9.2.3. See Figure 3-6 for a depiction of Green Pond Brook and the locations of the proposed SAFER construction site, the rock storage areas, the July 2010 samples, and access roads.

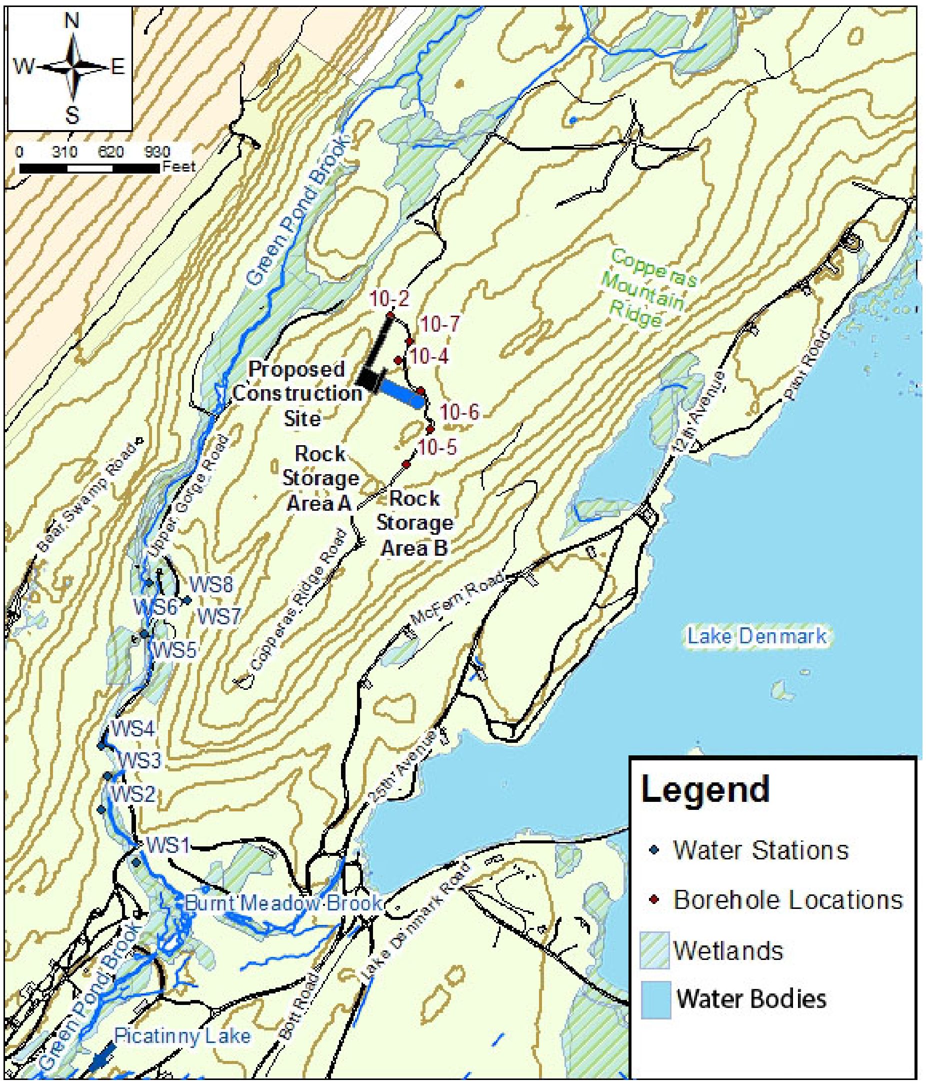

Figure 3-6. Locations of the Proposed SAFER, Access Roads, and the July 2010 Green Pond Brook Surface Water Samples

3.9.2 *Environmental Consequences – Biological Resources*

No Action Alternative

No impacts to biological resources at Picatinny Arsenal are anticipated under the No Action Alternative.

Preferred Alternative

The construction and operation of the SAFER test facility has the potential to impact biological resources (i.e., cause reduced survival or reproduction) due to destruction of forested habitat in the Gorge area, impaired water quality in Green Pond Brook and adjacent wetlands, increased noise and disturbance, and impaired air quality. All of these potential impacts are discussed in more detail in Sections 3.9.2.1 through 3.9.2.3.

Mitigation measures have been included in the design and would be instituted to minimize potential impacts to flora and fauna; and to reduce the potential significance of these impacts to moderate for the timber rattlesnake, and to minor or no impact for other species.

Additionally, in comparison to previous operating conditions, in which munitions testing was conducted in the open, munitions testing within the SAFER would likely result in less physical risk to both vegetation and wildlife. During open munitions testing, munitions fragments could injure or kill wildlife and could become imbedded in trees. Conducting munitions testing within a fully enclosed structure would eliminate these types of risks that were present during previous operating conditions.

Because no impacts are anticipated under the No Action Alternative, the remainder of this section focuses on potential impacts for the Preferred Alternative.

3.9.2.1 Vegetation

Construction. (Minor Impact) Impacts to vegetation due to SAFER construction are expected to be minor. The construction of the SAFER test facility is expected to result in the loss of approximately 7 acres of upland Mixed Oak forest in the Gorge area. This comprises approximately 0.17 percent of the total forested area (i.e., ~4,100 acres), and approximately 0.24 percent of mixed oak forest, at Picatinny Arsenal. The area to be cleared is more than 300 feet away from Green Pond Brook and associated wetlands, and therefore the proposed clearing meets INRMP requirements related to preservation of riparian vegetation. Additionally, disturbances, such as the proposed clearing, can present an opportunity for non-native species to invade an area.

Mitigation. Impacts to vegetation are not expected to be significant, and mitigation is not required. However, there are certain BMPs that may be implemented to further reduce impacts. In accordance with INRMP standards and guidelines related to invasive species, an assessment that determines the potential for new infestation in the deforested area may be conducted prior to construction.

Operations. (No Impact) No impacts to vegetation are expected due to SAFER operations. No additional vegetation would be cleared once the SAFER is constructed.

3.9.2.2 Fish and Wildlife

Mammals

Construction. (Minor Impact) The construction of the SAFER is expected to have short-term minor impacts on mammals. Impacts could occur through habitat destruction and incidental mortality during construction. However, because the area of habitat destruction is limited to 7 acres, significant impacts to mammal populations are not expected. Additionally, incidental mortality that could occur during tree felling is expected to be limited because mammals are likely to flee in response to chainsaw noise associated with tree clearing. Once the site is cleared of vegetation, most mammals are likely to move to areas with more favorable habitat, thereby reducing incidental mortality due to blasting during construction. Note, however, that brush piles and felled trees could create habitat for small mammals, which could be killed or injured if these piles are later moved, run over by construction equipment, or have rock deposited on top of them. Mitigations to protect listed snakes (Section 3.9.2.3) will also serve to protect small mammals from these potential impacts (i.e., felled trees and brush could be hauled away promptly as the area is cleared, or could be piled in an area away from the construction and rock storage areas and allowed to remain undisturbed).

In addition, there may be minor short-term negative impacts due to increased noise from blasting and disturbance, and decreased air quality. As discussed, however, mammals are likely to move to areas with higher quality habitat after the site is cleared, again limiting the potential for these types of adverse impacts.

Increased traffic on access roads to the proposed SAFER site may also cause occasional mortality of mammals, but this mortality is not expected to be significant. These impacts can be reduced to some degree through traffic control BMPs, including driver training and signage indicating speed limits. These traffic control BMPs are also included as mitigations for reptiles later in this section.

Operations. (No Impact) No impacts to mammals are expected due to SAFER operations. While there would be some increased noise and disturbance in comparison to the No Action Alternative, no measurable impacts on mammalian populations are expected.

Birds

Construction. (Minor Impact with Mitigation) The construction of the SAFER is expected to have minor direct impacts on birds, assuming tree felling at the site occurs during November through March. The Picatinny INRMP notes that the greatest disturbance to breeding bird populations is tree felling from May to July (Picatinny Arsenal, 2001). The USFWS has approved the felling trees at the SAFER site during 16 November through 31 March (USFWS, 2011a and b).

If tree felling occurs during November through March, impacts to breeding birds are expected to be minor. If tree felling occurs during May through July, there is a greater potential for impact to breeding birds due to possible destruction of eggs or mortality of nestlings in nests.

The possible destruction of forested habitat at the SAFER site may also have longer term negative impacts on birds by reducing the amount of available habitat for nesting and foraging.

However, considering the relatively small size of the planned deforestation, no significant impacts to bird populations are anticipated.

Similar to mammals, once the SAFER site is cleared of vegetation, birds would relocate to areas with more favorable habitat, which in turn would tend to reduce the potential for impacts due to blasting, noise, disturbance, and air quality.

Mitigation. Tree felling would occur during November through March to minimize impacts to breeding birds.

Operations. (No Impact) No impacts to birds are expected due to SAFER operations. While there would be some increased noise and disturbance in comparison to the No Action Alternative, no measurable impacts on bird populations are expected.

Fish, Reptiles, and Amphibians

Construction. (Minor Impact with Mitigation) The construction of the SAFER is expected to have minor impacts on fish, amphibians, and reptiles. The primary risk to fish, amphibians, and some reptiles posed by the construction of the SAFER is the potential degradation of water quality in Green Pond Brook and adjacent wetlands. The construction of the SAFER has the potential to increase loads of sediments and contaminants such as nitrates and ammonia, and to cause alterations in thermal and flow regimes, in Green Pond Brook. However, as discussed in Section 3.9.2.2, maximum-impact calculations suggest that potential changes in in-stream flow, temperature, and contaminants are expected to be minor or, in the case of contaminants, immeasurably low. In addition, because the locations of the rock storage areas are uphill from the construction site, away from Green Pond Brook, no significant sedimentation issues associated with the construction phase of the project are anticipated. Road construction would be required to access the rock storage areas. However, because the road construction would be relatively far from Green Pond Brook, the greatest potential for sedimentation issues that could arise would be associated with the mobilization and demobilization of the heavy equipment needed for the site excavation, road construction, and transport of rock from the construction site to the rock storage areas. Mitigation measures planned to minimize impacts are described in Section 3.9.

There is also potential for amphibians and reptiles to be adversely impacted by the destruction of forested habitat, as well as by noise and disturbance created by blasting and use of heavy machinery during construction. More discussion of these impacts to reptiles is provided in Section 3.9.2.3, which specifically examines potential impacts to the timber rattlesnake. Finally, as discussed for mammals, increased traffic on access roads to the proposed SAFER site may cause occasional mortality of reptiles (including wood turtles) and amphibians. Risk of road impacts to wood turtles is of particular concern, since wood turtles have been sighted in the Gorge area near Green Pond Brook. These impacts can be mitigated to some degree through traffic control measures, described below. A dewatering assessment is a required mitigation for this EA and would ensure that the dewatering system was not having any adverse impacts on Green Pond Brook.

Mitigation. To mitigate impacts during construction due to increased traffic on the access road to the proposed SAFER site, traffic control measures would be implemented, including driver training and signage indicating speed limits (15 miles per hour). In particular, drivers must be alert for wood turtles, box turtles, and snakes crossing Upper Gorge Road, as these taxa are commonly encountered during spring and summer. Also, the mitigations for brook trout and timber rattlesnakes, detailed in Section 3.9.2.3 below, would also serve to protect amphibians and other reptiles.

Operations. (No Impact) No impacts to reptiles, amphibians, or fish are expected due to SAFER operations. While there would be some increased noise and disturbance in comparison to the No Action Alternative, no measurable impacts on reptile, amphibian, or fish populations are expected.

3.9.2.3 Threatened and Endangered Species and Species of Concern

Construction. (Minor to Moderate Impact with Mitigations) Potential impacts to Federal and selected State-listed fish and wildlife species due to construction are discussed further in this section.

Operations. (Minor Impact) Impacts to Federal and State-listed species due to SAFER operations are expected to be minor, at worst. Very minor impacts to all listed species could be expected due to slightly increased noise and disturbance associated with SAFER operations. As previously discussed, detonations during operations would occur in the underground SAFER, and noise impacts are expected to be minimal.

Indiana Bat

Construction. (Minor Impact with Mitigations) The construction of the SAFER would cause increased noise and vibration, as well as very limited habitat loss. These impacts may affect, but are not likely to adversely affect, the Indiana bat. This section evaluates how the following potential impacts would be avoided: direct impacts to roosting bats, loss of roosting and foraging habitat, increased noise and vibration, air quality impairments, and water quality impairments that could decrease invertebrate prey populations. The implementation of BMPs and conservation measures are expected to eliminate or reduce potential impacts of these factors.

Also, in comparison to previous munitions R&D operations, the SAFER may reduce the physical risk to the Indiana bat due to the conduct of testing within a fully enclosed facility.

The USFWS New Jersey Field Office has concurred that the construction of the SAFER may affect, but is not likely to adversely affect, the Indiana bat (USFWS, 2012).

Direct Impacts to Roosting Bats. As discussed in Section 3.9.1.3, a tree survey of the 2-acre SAFER construction site was conducted in November 2010, and minimal dead limbs or trees that might afford summer roosting potential were observed (Van De Venter, 2011a). A second tree survey of the 5-acre rock storage areas was conducted in September 2011, and no potential roost trees were identified (Van De Venter, 2011b). The USFWS has approved the felling of trees at the 2-acre SAFER construction site and the 5-acre rock storage areas during 16 November through 31 March (USFWS, 2011a and b). Based on the November 2010 and September 2011 tree surveys, it appears unlikely that Indiana bats roost at the SAFER construction site or rock storage areas.

Loss of Roosting and Foraging Habitat. Deforestation of approximately 7 acres of forested habitat within a 0.75-mile Indiana bat zone of concern (see Figure 3-4) may be necessary for the construction of the SAFER, thereby reducing potential roosting and foraging habitat for the Indiana bat at Picatinny Arsenal. Despite this permanent loss of habitat, similar and ample forested area still exists in the immediate vicinity and on the Arsenal at large, affording summer foraging habitat for the Indiana bat (Van De Venter, 2011a and b). Picatinny has over 4,100 acres of forested land (Picatinny Arsenal, 2007b). This proposed action is in compliance with Indiana bat ESMP guidelines to minimize incremental or cumulative permanent loss of standing forest cover up to 7 percent or approximately 280 acres with up to 40 acres in riparian areas. In letters dated February 2, 2011, and November 16, 2011, USFWS concurred that the proposed tree clearing is not likely to adversely affect Federally-listed species, and the proposed loss of foraging and roosting habitat is not significant and in accordance with the Picatinny Arsenal Indiana Bat ESMP (USFWS, 2011a and b).

Noise and Vibration. As discussed in Section 3.4.1, construction activities would temporarily increase noise levels in the vicinity of the SAFER site due to vehicle use, heavy machinery, and explosive detonation to remove rock in the Gorge area. Construction is expected to last no more than six months, including only 85 days of blasting (when noise levels may be greatest) (CPI, 2012c). Consequently, only short-term impacts due to construction noise are anticipated.

To determine whether construction noise (i.e., noise from blasting and heavy equipment) may adversely impact Indiana bats, information from a Biological Assessment (BA) conducted at Fort Leonard Wood, Missouri (3D/Environmental, 1996) can be utilized. In support of the Ft. Leonard Wood BA, a comprehensive noise-related ecological risk assessment, which included experimental studies of noise and vibration effects on Indiana bats and little brown bats, was conducted. Four Indiana bat hibernacula and summer foraging habitat are known to exist at Fort Leonard Wood, and several training ranges are located in close proximity to these hibernacula. One of these ranges is located 0.4 miles from an Indiana bat hibernaculum, and activities at this range include demolition of explosive ordnance with peak sound levels as high as 130 dB (3D/Environmental, 1996).

Based on the results of studies conducted in support of the BA, the following noise-related restrictions were put in place at Fort Leonard Wood to protect the Indiana bat (3D/Environmental, 1996):

- During August 1 to May 31, no military activities (except for foot maneuvers) or development are permitted within a 531-foot radius of Indiana bat hibernacula.
- Within a 1,498-foot radius of Indiana bat hibernacula, noise simulation is prohibited from 1 hour before sundown to 1 hour after sunrise, from March 15 until April 30 and from September 1 until October 15.
- During August 1 to May 31, charges of 1,000-lb size must be detonated at least 1,000 feet away from hibernacula.
- Within a 6,337-foot radius of Indiana bat hibernacula, “disruptive activities are to be minimized within this zone, especially during spring and fall.”

Because the SAFER construction site is 2.7 miles (14,256 feet) away from the nearest Indiana bat hibernaculum, the proposed SAFER project would be compliant with all the restrictions put in place at Fort Leonard Wood.

Consequently, construction-related noise and vibrations are not likely to adversely affect the Indiana bat, and noise- and vibration-related mitigation measures are not required. However, to provide greater assurance construction-related noise and vibrations would not adversely affect the Indiana bat, all blasting would be prohibited from one hour before sundown to one hour after sunrise from April 1 through November 15.

Although available information summarized in this section suggests that this restriction is not necessary, implementation of this conservation measure would further ensure that SAFER construction does not negatively impact Indiana bat foraging.

The subsections that follow provide additional analysis regarding potential noise and vibration impacts on Indiana bats.

Sound Levels Anticipated for SAFER Construction Activities

As referenced in Section 3.4.1.1, sound levels up to 107 dB is anticipated for heavy equipment to be used during construction (3D/Environmental, 1996). Aboveground blasting may generate sound levels up to 110 dB (Siskind, 2000). Underground blasting would generate considerably lower sound levels than the aboveground blasting.

In addition to sound levels (in dB), it is important to consider the frequency of the sound (in hertz [Hz] or kilohertz [kHz]) when evaluating potential impacts on bats. Testing of sounds at Fort Leonard Wood determined that sounds from the operation of heavy equipment (bulldozers and earth movers) generated frequencies up to 20 kHz, with peak frequencies less than 0.125 kHz (3D/Environmental, 1996). Peak frequencies for aboveground blasting at the SAFER site are expected to be 0.002 to 0.004 kHz (Siskind, 2000). Expected sound levels and frequencies are summarized in Table 3-19.

Table 3-19. Sound Pressure Levels and Frequencies for SAFER Construction-Related Noise

Activity	Estimated Duration of the Activity	Sound Level (dB)	Frequency
Aboveground blasting	40 days	110 dB	Peak frequencies of 0.002 to 0.004 kHz
Underground blasting	45 days	<110 dB*	Peak frequencies of 0.002 to 0.004 kHz*
Operation of heavy construction equipment	Six months	107 dB	Up to 20 kHz (peak frequencies < 0.125 kHz)

**Sound data for underground blasting activities are not available, but sound pressure levels are expected to be considerably less than levels for aboveground blasting and frequencies are expected to be similar to those for aboveground blasting.*

Evaluation of Potential Noise Impacts on the Indiana Bat

As discussed above (and summarized in Table 3-19), peak frequencies for construction activities at the SAFER are expected to be <0.125 kHz. For comparison, Fenton and Bell's 1981 study of Indiana bats (as cited in Shapiro and Hohmann 2005) demonstrated peak echolocation frequency of 50 kHz with a range of 41 to 75 kHz. The lower limit frequency that is audible to Indiana bats has not been definitively determined. In the Camp Atterbury BA, TetraTech (2002) summarized the following relevant literature:

> *"A related bat species, the little brown bat (Myotis lucifugus), has a similar frequency range of echolocation calls (38 to 78 kHz)… Suthers (1970) indicates that peak auditory sensitivity of the bat auditory system is similar to peak frequencies of echolocation calls. Audiograms indicate that the little brown bat is sensitive to sound between 10 and 130 kHz, with greatest hearing sensitivity between 35 and 40 kHz (Grinnell, 1963; Dalland, 1965). Because little literature exists on the auditory capabilities of the Indiana bat, it is assumed the auditory sensitivity of the Indiana bat is similar to readily available data of the little brown bat…"*

Consequently, while bats may be able to hear some SAFER construction-related noise, the peak sound energy generated by blasting and heavy construction equipment to be used during SAFER construction is likely to be well below the frequencies audible to bats. Results of Fort Leonard Wood investigations also suggest that sound generated by training events (simulated artillery and small-arms fire) do not startle, frighten, or cause bats to flee the area. Radiotelemetric monitoring of Indiana bats near active night training ranges indicated that bats do not avoid active ranges or alter foraging behavior during night-time maneuvers (3D/Environmental, 1996). Shapiro and Hohmann (2005) also note that bats are able to alter the call frequency and the intensity of their own sounds to help discriminate between their own sounds and any ambient noise. Based on the above information, the noise generated by proposed construction activities at the SAFER is unlikely to interfere with Indiana bat foraging.

Additionally, Camp Atterbury, a National Guard training facility in south-central Indiana, is known to provide summer foraging habitat supporting three to five Indiana bat maternity colonies (TetraTech, 2002). Military activities at Camp Atterbury have included the use of heavy military vehicles, artillery firing, mortar firing, aircraft training, and machine gun and grenade range practice, which generate peak sound levels up to approximately 140 dB and peak frequencies of 0.2-1.0 kHz (TetraTech, 2002). USFWS (2007b) has determined, "There is no evidence that the long-term viability of Camp Atterbury's bat population has declined as the result of military activities."

Finally, it is important to note that the noise generated by SAFER construction would be temporary, lasting approximately six months. Based on the above analysis, construction-related noise is not likely to adversely affect Indiana bats.

Available Literature Related to Vibration Effects on Indiana Bats

Based on a comprehensive literature review, the only experimental study of vibration effects on Indiana bats was a study conducted in support of the Ft. Leonard Wood BA (3D/Environmental, 1996). This study examined vibration effects on hibernating bats and results are not directly relevant to the proposed SAFER project, since vibrations from SAFER construction blasting would not be detectable in Indiana bat hibernacula located over 2 miles away.

The Ft. Leonard Wood BA identified two field investigations of vibration impacts on Indiana bats (again, primarily focused on effects on hibernating bats), and determined that a PPV of 0.1 inches per second (in/sec) could be considered a safe threshold for Indiana bats

(3D/Environmental 1996). This threshold was based on investigations of quarrying activity near an Indiana bat hibernaculum at Jamesville, NY. In use since 1920, the quarry generates PPVs of at least 0.25 in/sec. Seasonal observations of the hibernating colony in the 1970s indicated an increasing population, and on this basis, Besha (1984) recommended the use of 0.10 in/sec as a safe threshold for Indiana bats. This threshold is highly uncertain and may be overprotective because an effect level (i.e., a PPV at which effects were observed) has not been determined and there is evidence that PPVs as high as 0.25 in/sec did not cause impacts on the Jamesville bat population. Nonetheless, it is the best available threshold and is used in the evaluations below. For reference, a number of common non-blast sources also produce PPVs in the range of 0.08 to 0.2 in/sec, including heavy trucks (e.g., 24-28 ton) driving over a 3-4 inch bump (Siskind, 2000).

Additionally, there is observational evidence that Indiana bats sometimes roost in locations where they may be subject to vibrations. At Camp Atterbury, Indiana bats have been observed roosting under three bridges. One of these bridges experiences average daily traffic up to 5,000 vehicles per day (Kiser et al., 2002).

Evaluation of Potential SAFER Vibration Impacts on the Indiana Bat

As discussed in Section 3.4.1.2, vibration is typically measured as peak particle velocity or PPV. PPV can be modeled as a function of (1) the distance from the blast, and (2) the charge weight per delay (using the equations provided in Section 3.4.1.2).

For aboveground blasting that would occur at the SAFER site, the typical charge weight per delay (W) would be 50 lbs (CPI, 2012d). Higher values of W (up to 200 lbs) would occasionally be needed (CPI, 2012d). Table 3-20 summarizes the results when PPV is set equal to the Indiana bat threshold of 0.1 in/sec (discussed above). As shown in Table 3-20, an area of approximately 14 acres would experience vibrations greater than 0.1 in/sec for typical detonations, and an area of approximately 55 acres would experience vibrations greater than 0.1 in/sec for less frequent, larger detonations.

Table 3-20. Area Potentially Impacted by Vibrations from Aboveground Blasting

Charge Weight per Delay	Distance at which PPV = 0.1 in/sec	Area with PPV > 0.1 in/sec
Typical - 50 lbs	437 feet	13.8 acres
Maximum - 200 lbs	875 feet	55.2 acres

For underground blasting, the expected maximum charge weight per delay is 150 lbs (CPI, 2012d). The calculated distance where the PPV = 0.1 in/sec is 390 feet and the area with PPV > 0.1 in/sec is approximately 11.0 acres (see Table 3-21).

Table 3-21. Area Potentially Impacted by Vibrations from Underground Blasting

Maximum Charge Weight per Delay	Distance at which PPV = 0.1 in/sec	Area with PPV > 0.1 in/sec
150 lbs	390 feet	11.0 acres

Based on results in the preceding tables, the maximum area with PPV exceeding the threshold of 0.1 in/sec is approximately 11 to 55 acres. Relative to the home ranges observed for Indiana bats, this area is comparatively small. Literature estimates for Indiana bat home ranges are highly variable, ranging from 151 to 887 acres (Rommé et al., 2002; Menzel et al., 2005). The potentially affected area is also small relative to the amount of available habitat at Picatinny Arsenal, up to 4,100 acres of forested land (Picatinny Arsenal, 2007b).

Additionally, the distance at which the vibrations are expected to be undetectable (i.e., PPV <0.005 in/sec) (3D/Environmental, 1996) is 4,535 ft for 200-lb charges. As a result, vibrations from the proposed SAFER construction would not be felt by bats in the closest hibernaculum, which is over 14,000 feet from the SAFER site.

Based on the above evaluation, vibrations from aboveground and underground blasting are not likely to adversely affect Indiana bats.

Air Quality. Section 3.5.2 evaluates possible impacts of SAFER construction activities on air quality and, based on modeled air emissions, concludes that impacts on air quality due to construction activities are expected to be negligible. Despite this conclusion, BMPs would be implemented to minimize generation of fugitive dust and gaseous air pollutants. These BMPs may include, but are not limited to, keeping haul roads watered down and turning off equipment when not in use (see Section 3.5.2). It should be noted that in its Draft Recovery Plan for the Indiana bat, USFWS does not cite air quality impacts as a threat to this listed species (USFWS, 2007a). Similarly, the Picatinny Arsenal Indiana Bat ESMP (Picatinny Arsenal, 2007b), which was approved by USFWS in November 2007, does not include any management prescriptions related to air quality. Based on this information, adverse effects to the Indiana bat due to air emissions are not likely.

Food Resources. Indiana bats consume invertebrates that have entirely terrestrial lifecycles as well as invertebrates that are aquatic during the larval phase of their lifecycles (Murray and Kurta, 2002). The closest permanent aquatic habitat to the proposed SAFER site is Green Pond Brook and adjacent wetlands. A perennial spring exists between the SAFER site and Green Pond Brook (see Section 3.9.1); however, minimal changes in the flow rate of the spring from construction activities would have a negligible impact on food resources within the wetted area between the spring and Green Pond Brook. As discussed in Section 3.9.2, no significant water quality impacts to Green Pond Brook or other surface water resources in the area are anticipated. Consequently, invertebrate prey that inhabit nearby surface water resources are not likely to be adversely affected by SAFER construction activities due to changes in water availability or water quality.

Mitigations. To ensure that appropriate conservation measures are planned and implemented to protect the Indiana bat, the SAFER Project Management Team would coordinate with the Picatinny Natural Resources Manager and comply with all Indiana Bat ESMP management prescriptions. The time period during which trees may be felled must be restricted to prevent the felling of occupied roost trees. The USFWS has approved the felling of trees at the 2-acre SAFER construction site and 5-acre rock storage areas from 16 November through 31 March (USFWS, 2011a and b). In addition, to ensure Indiana bats are not adversely affected by construction-related noise, all construction blasting would be prohibited from one hour before sundown to one hour after sunrise from 1 April through 15 November.

Operations. (Minor Impact) This section evaluates how the following potential impacts would be avoided: direct impacts to roosting bats, loss of roosting and foraging habitat, increased noise and vibration, air quality impairments, and water quality impairments that could decrease invertebrate prey populations.

The USFWS New Jersey Field Office has concurred the operation of the SAFER may affect, but is not likely to adversely affect, the Indiana bat (USFWS, 2012).

Direct Impacts to Roosting Bats. No tree felling is anticipated during SAFER operations. Additionally, the design of the SAFER doors ensures that bats would not be able to enter (or roost within) the SAFER chamber. The doors are designed with 1-3/4-inch commercial polyurethane insulated overhead doors with a PVC strip and cap between sections to resist air infiltration and provide a tight fit. The doors comply with ASTM E 283 – maximum air infiltration rate of 0.08 cubic feet per minute (cfm) at 15 mph and 0.08 cfm at 25 mph. The door frame would be sealed to the facility's structure using a continuous robust rubber track, which will preclude any insects, bats and other wildlife from entering the chamber. Picatinny Arsenal uses this type of door in other areas on the installation, and no wildlife has been found in the facilities.

Loss of Roosting and Foraging Habitat. No tree felling or habitat loss is expected to occur during SAFER operations.

Noise and Vibration. While it is anticipated that small increases in sound levels due to munitions testing would occur during operations, these sound levels are not likely to adversely affect the Indiana bat. Based on available ARDEC data, 131.8 dB is the peak sound level recorded for munitions testing; however, anecdotal evidence suggests sound levels from munitions testing outside of the chamber would be 90 percent lower than the levels inside the chamber.

Similarly, vibrations from munitions testing within the chamber are expected to be significantly less than vibrations generated by construction activities and are not likely to adversely affect Indiana bats.

Operations of the SAFER would include operators travelling to and from the site, which was previously unused in this portion of the Gorge. The impacts from the vehicular traffic are expected to be minimal because the disturbance would occur during workday hours, when bats are not actively foraging.

Air Quality. Section 3.5.2 evaluates possible impacts of SAFER operations on air quality and, based on modeled air emissions, concludes that impacts on air quality do not exceed regulatory thresholds designed to be protective of human health. It should be noted that in its *Draft Recovery Plan for the Indiana Bat*, USFWS does not cite air quality impacts as a threat to this listed species (USFWS, 2007a). Similarly, the Picatinny Arsenal Indiana Bat ESMP (Picatinny Arsenal, 2007b), which was approved by USFWS in November 2007, does not include any management prescriptions related to air quality. Based on this information, adverse effects to the Indiana bat due to air emissions are not likely.

Food Resources. Indiana bats consume invertebrates that have entirely terrestrial lifecycles as well as invertebrates that are aquatic during the larval phase of their lifecycles (Murray and Kurta, 2002). The closest permanent aquatic habitat to the proposed SAFER site is Green Pond Brook and adjacent wetlands. A perennial spring exists between the SAFER site and Green Pond Brook (see Section 3.9.1); however, minimal changes in the flow rate of the spring from operational activities would have a negligible impact on food resources within the wetted area between the spring and Green Pond Brook. As discussed in Section 3.7.2, no significant water quality impacts to Green Pond Brook or other surface water resources in the area are anticipated. Consequently, invertebrate prey that inhabit nearby surface water resources are not likely to be adversely affected by SAFER construction activities due to changes in water availability or water quality.

Bog Turtle

Construction and Operations. (No Impact) The nearest possible bog turtle habitat is more than 3,000 feet northeast of the proposed SAFER site, and no impacts to the bog turtle are anticipated.

Timber Rattlesnake

Construction and Operations. (Minor to Moderate Impact with Mitigations) Potential impacts to the timber rattlesnake are expected due to destruction of forested habitat, increased traffic on Upper Gorge Road, and increased noise and disturbance. No significant impacts are expected due to habitat destruction, given the relatively small 7-acre area (maximum) that is to be cleared.

As discussed in Section 3.9.1.3, a series of surveys for timber rattlesnakes and northern copperheads was conducted during August 2011 to August 2012. The survey report concluded that the habitat located south and east of Rock Storage Area B, corresponding to the top and east-facing slope of the southern end of Copperas Ridge, represents the habitat most used by the timber rattlesnake and northern copperhead (E2PM, 2012).

Based on these survey results, noise impacts are likely to be minor. Highest noise levels will occur at the SAFER chamber site, and not within the most important habitat areas identified for the timber rattlesnake and the northern copperhead.

Note also that brush piles and felled trees could create habitat for snakes, which could be killed or injured if these piles are later moved, run over by construction equipment, or have rock deposited on top of them. Mitigations to protect listed snakes from these types of hazards are described below.

Mitigation. The presence of timber rattlesnakes in the vicinity of the SAFER site has been confirmed by recent snake surveys; therefore, mitigation measures would be required to avoid population-level adverse impacts to the species. In accordance with recommendations made by the NJDEP ENSP-qualified biologists who conducted the surveys (E2PM, 2012), the Garrison agreed on the following mitigations:

- All people entering the construction site would be educated in identification and hazards of venomous snakes and procedures to be followed if a rattlesnake or copperhead is encountered.
- If a listed snake (i.e., timber rattlesnake, northern copperhead) is sighted during construction or operations, the Picatinny Natural Resource Manager would be notified. Rattlesnakes and copperheads must not be killed or molested. Signage with these prohibitions would be posted at the SAFER site and rock storage areas.
- Picatinny Arsenal would maintain a minimum cleared buffer of 10 feet with no cover vegetation or rock around the rock storage areas to eliminate the open rock/forest interface habitat that snakes prefer.

- Seasonal tree clearing restrictions that will be implemented to protect the Indiana bat will also serve to protect State-listed snakes.
- Any felled trees and brush would either be promptly removed and hauled away, or piled in areas away from construction activities/rock storage areas and allowed to remain undisturbed in perpetuity.
- The use of Rock Storage Area B would be avoided to the extent practicable, particularly during the snakes' active season (i.e., between 1 April and 31 Oct). If any activities in Rock Storage Area B occur between 1 April and 31 Oct, an NJDEP ENSP-qualified snake monitor would be present onsite for the duration of the activities. The snake monitor would capture and relocate any observed snakes (and other listed wildlife) to an area outside the active workspace, in accordance with NJDEP ENSP protocols (NJDEP, 2012b).
- Passage points for snakes and other wildlife would be included in all silt fencing.
- To mitigate impacts during construction due to increased traffic on the access road to the proposed SAFER site, traffic control measures would be implemented, including driver training and signage indicating speed limits of 15 miles per hour. In particular, drivers must be alert for snakes crossing Upper Gorge Road during spring and summer, when they are commonly encountered.

Northern Copperhead Snake

Construction and Operations. (Minor to Moderate Impact with Mitigation) Impacts to the northern copperhead snake are likely to be minor to moderate and generally similar to those described above for the timber rattlesnake.

Mitigation. The mitigations listed above for the timber rattlesnake would also serve to protect the northern copperhead.

Brook Trout

Construction and Operations. (Minor with Mitigations) Impacts to brook trout due to SAFER construction are expected to be minor with planned mitigations. The proposed SAFER site is sufficiently far (i.e., greater than 500 feet) from Green Pond Brook and associated wetlands that the planned deforestation of 7 acres of land that is not contiguous to the brook is unlikely to impact surface water temperatures. The potential impacts of the construction of the SAFER to water quality characteristics that are important to the survival and reproduction of brook trout, including stream flow, temperature, chemical contamination, and sedimentation, are discussed in this section.

Based on current construction plans and the analyses below, no significant impacts to brook trout are anticipated. In the absence of mitigations, impacts to brook trout (if present in affected portions of Green Pond Brook) could be significant.

If dewatering becomes necessary during the course of facility construction and/or operations, there is potential for impact on Green Pond Brook stream flow and temperature. Quantitative, maximum-impact estimates of flow and temperature changes are detailed in Section 3.7.2. In the spring, when flow impacts would be the greatest, stream flow in Green Pond Brook could be reduced by a maximum of 1.6 percent if dewatering is needed. Maximum-impact calculations for temperature indicate that there could be an increase of as much as 0.42°C in the stream temperature due to loss of cooling from the cold spring flow originating from the construction site. Note, however, that dewatering in the summer/fall is less likely to be needed than in spring; if no dewatering occurs in the summer, there would be no change in summer water temperatures. Similarly, due to conservative assumptions used in the maximum impact calculation, actual temperature increases in Green Pond Brook during fall, winter, and spring are expected to be much less than 0.42°C. Refer to Section 3.7.2 for details regarding these calculations.

Based on these analyses, impacts to brook trout are not expected to be significant, even if dewatering is needed. Brook trout are most sensitive to flow and temperature changes in the summer and fall, when flows are lowest, temperatures are highest, and spawning occurs. Little or no change in summer and fall stream flows and temperatures is anticipated. Minimal changes to stream flow and temperature are anticipated in the spring, and no significant impacts to brook trout are anticipated. Additionally, no significant impacts to brook trout are expected due to increases in chemical contamination in Green Pond Brook. As detailed in Section 3.7.2, increases in nitrate and ammonia concentrations are possible in Green Pond Brook, but are expected to be immeasurably small based on the modeling presented in Appendix B.

Finally, there is potential for the construction of the SAFER facility to increase sedimentation in Green Pond Brook, which could in turn reduce brook trout reproduction in Green Pond Brook. For spawning, fluvial brook trout prefer substrate ranging from gravel to boulder, with very little fine grained sediments. Increased sedimentation would likely have adverse impacts on brook trout reproduction (Scruton et al., 2000).

As discussed in Section 3.7.3, because there is a hill between the proposed SAFER site and Green Pond Brook, airborne material created during construction blasting and loading is expected to deposit on the project-side of the hill. Upper Gorge Road adjacent to Green Pond Brook (Figure 3-6), and increased sediment loads to the brook (due to runoff and kickout resulting from increased use of this road during construction) are possible in the absence of mitigation measures.

However, because the rock storage areas would be uphill from the SAFER construction site and away from Green Pond Brook, the greatest potential for sedimentation issues would be associated with the mobilization and demobilization of the heavy equipment that would be working at the construction site, building the road to the rock storage areas, and transporting rock from the construction site to the rock storage areas. With the implementation of mitigation measures, sedimentation impacts to Green Pond Brook from the use of the road leading to the construction site would be minimized, and no significant impacts to brook trout are expected.

Mitigation. Sampling and analysis would be conducted in accordance with the monitoring plan (baseline, construction, and operations) to ensure maintenance of water quality in Green Pond Brook. Temporary silt fences would be installed to minimize traffic and construction-related erosion. Additional controls would be implemented if necessary based on monitoring results and permitting requirements (e.g., Erosion and Sedimentation Control Plan).

3.10 Cultural Resources

3.10.1 *Affected Environment – Cultural Resources*

The area of potential effects (APE) for the proposed project was concurred on by the State Historic Preservation Office (SHPO) as shown in the correspondence letter in Appendix E. Overall, historical literature and reports for the installation have been performed, conducted, and documented since the early 1930s. These documents consist of archaeological and Cultural Resource Management reports, planning documents, historic structures reports, and installation histories. The totality of these informational sources has been used to ascertain the existing Cultural Resources, land use patterns and potential archaeological site sensitivity within the installation.

The APE for the proposed project is shown in Figures 1-3 of SHPO correspondence in Appendix E. The proposed SAFER is not located within any of Picatinny's known and identified historic districts. This area has been identified as archaeologically sensitive and is summarized in the 2009-2013 Integrated Cultural Resources Management Plan as Sensitivity Area 43: "[potentially containing] hunting and gathering camps or rockshelters, upper elevations of Copperas Mountain" (ICRMP, 2008). Historic period development in the area began with the construction in 1876 of a wagon road between Lake Denmark and Green Pond for a proposed development which was eventually abandoned in 1882. The lands in and around the APE were taken over by the U.S. Army in 1943. Development in the area between the 1940s and 1960s included roads, igloo magazines (now the 1200 Area), improvements along Upper Gorge Road for the later 1240 range, and development along Copperas Ridge Road for a water tank for the 1222 range. A former 500 meter firing point for the 1240 range is at the beginning of the APE (ICRMP, 2008).

Site visits were made to the project area and its APE in December 2009, June 2010, and November 2010 by the Cultural Resource Manager. During these visits, much bedrock was observed on the surface, with no identifiable archaeological sites or features of potential National Register of Historic Places (NRHP) significance. No petroglyphs or rock art were observed within the APE. A small rock overhang was observed within the valley, but outside the APE; this overhang is not large enough to have been used for shelter or storage. A small stone wall is located at the edge of the top of the slope of the tree clearance area. The wall appears to be modern, dating from the Army's construction activities during the 1940s. The New Jersey SHPO concurred with a determination by the Army that no historic properties would be affected based upon the 2010 surveys (refer to Appendix E) (Saunders, 2011).

A subsequent Phase I Cultural Resources survey was conducted of the proposed rock storage areas (see Area A and Area B in Figure 2-3). ARDEC conducted 54 shovel test pits along 12 transects across Area A and Area B, and found no archaeological deposits. One potential site was found outside of the APE; this was a possible collier's hut, which may represent a significant cultural resource. It was noted that, due to its location away from the proposed sites, that feature would not be impacted by constructing or operating the SAFER. Based upon the surveys and information provided, SHPO determined that, "the proposed rock storage locations to be used as construction staging and reuse areas for the SAFER Cave will pose No Effect to historic archaeological properties." No further Section 106 consultation is required, unless additional resources are discovered during the project implementation and pursuant to 36 CFR 800.13 (Saunders, 2011).

3.10.2 *Environmental Consequences – Cultural Resources*

No Action Alternative

No construction or ground disturbing activities would take place under the No Action Alternative. No impacts to cultural resources are anticipated under this alternative.

Preferred Alternative

Construction and Operations. (No Impact) Based upon the findings of the New Jersey SHPO, the construction and operation of the SAFER test facility would have no effect on historic properties or archaeological sites that are listed or eligible for listing in the NRHP. No NRHP listed or eligible resources were identified within the proposed project's APE. Large parts of the APE consist of slopes and bedrock, with low potential for cultural deposits.

Ground disturbing activities within the archaeologically sensitive area of the APE, as defined by the 2009-2013 ICRMP, would be limited to excavations tying into roof cables located within the SAFER structure and activities at rock storage areas (Area A and Area B.) The excavations would be comparable in size to geotechnical borings. Considering the minimal size of these excavations, the potential for impacts to NRHP-eligible archaeological deposits is low. Standard operating procedures would be implemented during construction to ensure that the Garrison Archaeologist would be notified for further investigation if any archaeological or cultural deposits are discovered.

3.11 Hazardous Materials & Hazardous Waste

3.11.1 *Affected Environment – Hazardous Materials & Hazardous Waste*

Research and development operations at the installation generate a large variety of hazardous wastes, with approximately 90 individual points of waste generation. Hazardous waste generation at the installation has declined dramatically in recent years, and Picatinny continues to meet Army goals for waste minimization. Hazardous waste generated at Picatinny Arsenal is stored, managed, and manifested in accordance with applicable regulations promulgated under the Resource Conservation and Recovery Act (RCRA). Picatinny Arsenal currently maintains a RCRA permit for hazardous waste storage (NJDEP permit number 1409E1HP07). NJDEP has also issued an interim permit to Picatinny authorizing storage, open burning, and open detonation (OB/OD) of waste or excess explosives and propellants.

Construction of the SAFER facility requires the use of hazardous materials, including ANFO and petroleum/oils/lubricants (POL). Approximately 1,000 pounds of ANFO would be used per day during blasting portions of the project. All shipments of ANFO to the blasting site would strictly adhere to U.S. Department of Transportation (USDOT) regulations for packaging and shipping. In addition, all such shipments would be coordinated in advance with Army security personnel to obtain safe entry to Picatinny Arsenal and restricted areas within the installation (i.e., the 1200 Gorge Test Area).

Although the chemical mixture that makes up ANFO is stable and may be easily handled by a certified user, guidelines for handling ANFO would be developed and implemented during the blasting process. These SOPs would include recommendations for minimum clearance distances and personal protective equipment (e.g., goggles, gloves, coveralls, self-contained breathing apparatus in poorly ventilated or confined areas shortly after explosions), as well as safety requirements for transportation of excavated rock.

Water accumulating in collection basins located outside the cave entrance would be regularly removed for treatment elsewhere on the Arsenal, if necessary. POLs may be released into the environment as a result of spills during fueling or leakage from construction vehicles. Applicable installation-specific procedures for POL management and spill response would be implemented as appropriate during construction of the SAFER.

Personnel in the Gorge area may also encounter UXO during the construction phase of the SAFER project. In accordance with existing installation-specific SOPs for UXO management, EOD personnel would escort workers during all construction activity in the Gorge area. The site would also be cleared of any identified UXO prior to construction. In the event that UXO is encountered during construction, the site would be cleared and a UXO support contractor would evaluate the discovery and associated hazards. All appropriate SOPs for EOD clearance and UXO avoidance/handling would be implemented during construction of the SAFER.

R&D operations to be conducted within the SAFER and Gorge Test Area are not subject to RCRA requirements. Specifically, as long as the purpose of the SAFER is for development and testing of IM and fielding safe technology to the operational environment, it is not subject to RCRA. Under the Military Munitions Rule, if the detonation is part of the normal use of the munitions at the facility it is not subject to RCRA (because the munitions would be a product, not a waste).

Nevertheless, wastes generated as a result of munitions R&D may be subject to RCRA regulation. According to the Army Phase II Munitions Report, combustion of munitions does not result in complete destruction. Consequently, a small amount of uncombusted hazardous material would remain in the SAFER chamber after testing. When conducting munitions testing within the SAFER facility, some portion of the residue and explosive constituents from the explosion would cling to fixed surfaces within the chamber. Fragments, fines, and explosive residue would be collected after every test.

Management and disposal of these wastes would comply with the Military Munitions Rule in 40 CFR Part 266, Subpart M, DOD Directive 4715.11 (Environmental and Explosives Safety Management on DOD Active and Inactive Ranges within the United States), other applicable DOD Instructions and Directives, and the most current *Installation Hazardous Waste Management Plan (IHWMP).* Per 62 FR 6622, *Military Munitions Rule: Hazardous Waste Identification and Management; Explosives Emergencies; Manifest Exemption for Transport of Hazardous Waste on Right-of-Ways on Contiguous Properties*, unused and used military munitions may be subject to RCRA hazardous waste regulations when being disposed. Pursuant to 40 CFR Section 266.202(b), unused military munitions become solid waste under RCRA when they are: (1) removed from storage for disposal or treatment prior to disposal, (2) leaking or deteriorated so that they cannot be recycled or reused, or (3) declared a solid waste by an authorized military official.

Similarly, under 40 CFR Section 266.202(c), a used military munition is classified as solid waste when transported from the site of use for the purposes of storage, disposal, or treatment prior to disposal. Waste military munitions that exhibit a hazardous waste characteristic or are listed as a hazardous waste under 40 CFR Part 261 are subject to regulation under all applicable RCRA standards in 40 CFR Parts 260 through 270 while being accumulated, transported, stored, treated, or disposed. Wastes from the SAFER that are to be recycled as scrap metal – and therefore exempt from RCRA regulation under 40 CFR Section 261.4(a)(13) – will be properly demilitarized prior to recycling.

Picatinny Arsenal has been designated a National Priority List (NPL) site under CERCLA, and numerous Defense Site Environmental Restoration Tracking System sites have been identified at the installation. The most widespread contaminants of concern at the Arsenal include volatile organic compounds, semi-volatile organic compounds, metals, trichloroethylene, polychlorinated biphenyl, benzo(a)pyrene, nitroaromatics, explosives, unexploded ordnance, propellants, radiological material, and pesticides. Media of concern at Picatinny Arsenal include groundwater, soil, and sediment. However, the proposed site location within the 1200 Gorge Test Area is not identified as a CERCLA site. Consequently, CERCLA does not apply to the activities to be conducted within the SAFER and Gorge Test Area.

3.11.2 *Environmental Consequences – Hazardous Materials & Hazardous Waste*

No Action Alternative

The No Action Alternative would not increase the use of hazardous materials, such as ANFO and POL, at Picatinny Arsenal.

Preferred Alternative

Construction. (Minor Impact) Construction of the SAFER facility would have a short-term minor impact on this resource area. Necessary blasting operations and heavy equipment would increase use of hazardous materials, such as ANFO and POLs. However, use of these materials would be limited to the construction period, currently estimated to last approximately six months, although the six months may not be consecutive due to seasonal restrictions on tree clearing and other activities. The potential impact of these materials is discussed in detail in Section 3.7, Water Resources. As indicated in Section 3.7.3, decisions related to mitigation measures would be made upon completion of a rock feasibility study, during which additional site-specific information would be gathered. Because the UXO support contractor would clear the SAFER site and accompany construction personnel, risks associated with UXO would be minimized. All construction activities would adhere to Federal, State, and local hazardous material handling requirements.

Operations. (Minor Impact) Operations of the SAFER facility would have a minor impact on this resource area. The SAFER facility design incorporates numerous features to prevent release of contaminants into the environment during and after munitions testing events. The proposed SAFER facility is an earth-covered, self-contained chamber with rock ceilings, rock walls, and a concrete floor. The SAFER would have blast doors to prevent munitions fragments from exiting the chamber. The floors of the access entries and the chamber itself would be designed to provide active drainage to an outside collection basin. A French drain design would also be imprinted in the concrete where the flooring meets the cave walls to direct moisture from the walls to the collection basin and sump. Water collected in the basin/sump system outside the cave entrance would be regularly removed for treatment elsewhere on the Arsenal. A geo-liner would be installed beneath the cave floor to act as a redundant system that eliminates any potential for contaminants to migrate through cracks in the concrete to the water table. Similar geo-liners are used in the construction of waste disposal landfills to insure against leachate reaching public drinking water supplies.

The SAFER design also includes a vertical ventilating stack, equipped with filter and fan to insure against fragments leaving the facility and to minimize deposition of heavy metals or other detonation byproducts concentrating on the hillside outside the SAFER chamber. Additional information on this design feature is presented in Section 2.3.

Management and disposal of wastes generated within the SAFER facility, including the products of incomplete combustion, would comply with all applicable DOD, Federal, State, and local hazardous waste requirements. Wastes generated during SAFER operations that meet the definition of hazardous waste in 40 CFR Part 261 will be accumulated, transported, stored, treated, and disposed in accordance with the RCRA regulations in 40 CFR Parts 260 through 270.

In addition, when the SAFER is taken out of service, a closure plan will be developed to ensure that RCRA closure requirements applicable to hazardous waste generators are properly implemented. As appropriate, all contaminated equipment, structures, and soils will be removed and/or decontaminated to minimize the need for further maintenance and prevent post-closure escape of hazardous waste or hazardous waste constituents.

3.12 Socioeconomics & Environmental Justice

Socioeconomics evaluates the degree to which the Preferred Alternative affects levels of employment, use of existing infrastructure, and/or family income. Environmental Justice considers whether the Preferred Alternative would result in a disproportionate impact to minorities or low-income individuals, or causes health and safety risks for children (Executive Order [EO] 13045).

3.12.1 *Affected Environment – Socioeconomics & Environmental Justice*

Picatinny Arsenal is located in Morris County, New Jersey, which is considered the socioeconomic ROI for the installation. Morris County, New Jersey, is one of 21 counties in the State of New Jersey. The U.S. Census Bureau estimates that, in 2009, 488,518 people lived in Morris County. This 2009 estimate also indicates that the 2008 median household income was $99,258 while the State of New Jersey's median house holds income $70,347 (U.S. Census Bureau, 2000).

As required by EO 12898, Federal Government agencies must identify and address any environmental activities that impact minorities or low-income populations disproportionately. A minority population is considered, for the purposes of this document, as persons classified by the U.S. Census Bureau as Negro, Black, or African-American; Hispanic; Asian or Pacific Islander; American Indian, Eskimo, or Aleut; or other non-white persons. A low-income population is considered a group of people or a community that, as a whole, lives below the national poverty level. The area surrounding the Arsenal is not composed of a disproportionate amount of minorities or low income population.

As shown in Appendix F, U.S. Census Bureau data indicate that the percent of the population living below the poverty level as of 2008 in Morris County was 4.0 percent, as compared to the

State of New Jersey estimate of 8.7 percent. Furthermore, U.S. Census Bureau data indicate the minority population of approximately 24 percent is below the State estimate of 31 percent.

Additionally, census data indicates that the median value of $200,665 for owner-occupied housing in the Newark Primary Metropolitan Statistical Area (which includes Morris County) was considerably higher than the State-wide median value. Furthermore, median values for owner-occupied housing units within the Newark Primary Metropolitan Statistical Area (PMSA) range from over $250,000 in Morris County to less than $160,000 in Sussex and Warren counties (U.S. Census Bureau, 2000). The State-wide median housing value approximated $168,000 in 2000.

Because the SAFER would be located within the Arsenal, it is not anticipated to result in any disproportionate adverse effects on low-income or minority populations. It is located in a county with higher housing values, lower poverty rates and higher incomes then the adjacent counties and the State-wide averages.

Picatinny Arsenal is the third largest employer in Morris County and provides a major positive economic impact to the region. The cost to construct the SAFER is approximately $1.8 million. The construction phase would potentially employ additional personnel to assist with the construction, rock removal, tree clearing, and construction of the SAFER. As such, there is a potential for a short-term positive economic benefit and indirect beneficial impacts from investment in the local economy.

3.12.2 *Environmental Consequences – Socioeconomics & Environmental Justice*

No Action Alternative

Implementing the No Action Alternative would result in no changes to the current local economy.

Preferred Alternative

Construction. (Beneficial Impact) Implementing the Preferred Alternative would not significantly impact the socioeconomic situation. There would be temporary direct and indirect benefits during construction period. The Preferred Alternative would have no impact on any residences or businesses within the confines of the Arsenal. However, the jobs created by this action would be temporary, construction-related employment. The construction-related jobs are likely to be filled by regional employees. The Preferred Alternative would not impact regional population, housing demand, or schooling requirements (Obrien & Gere, 2008).

The SAFER would not impact disproportionately any minority or low income populations as it would not be located in or near a residential community or area of minority or low-income populations.

Pursuant to EO 13045, the construction activities associated with the Preferred Alternative would also not impact the health of children as the site is not easily accessible by children, nor are there schools or residences nearby.

Operations. (No Impact) Operation of the Preferred Alternative would not impact the socioeconomic climate as the jobs required to operate the facility are anticipated be filled by current Arsenal employees. Additionally, operation of the Preferred Alternative would not result in disproportionate adverse impacts to low-income or minority groups, as the location of the SAFER would not be within or near an area with a disproportionate population of low income families and minorities.

Pursuant to EO 13045, the operation of the Preferred Alternative would not impact the health of children as it would not be easily accessible by children, nor would there be schools or residences nearby.

3.13 Human Health & Safety

3.13.1 *Affected Environment – Human Health & Safety*

Some elements of construction have an inherent safety risk. The construction contractor would prepare and implement a worksite safety plan to reduce the risk of injury to the construction workforce. This safety plan would be implemented during all on-site activity including, but not limited to, UXO clearance by a UXO support contractor, clearing of vegetation, blasting, installation of structural facility components, and loading/transporting excavated rock to the stone storage area located approximately one-half mile from the SAFER site. These SOPs would include recommendations for minimum clearance distances during blasting and requirements for personal protective equipment (e.g., goggles, gloves, coveralls, self-contained breathing apparatus in poorly ventilated or confined areas shortly after explosions).

Military munitions testing also involves inherent health and safety risks. ARDEC has developed and implemented policies and procedures to ensure the safety of the testing workforce and range personnel. For example, ARDEC has established a requirement that detonation chambers have a 99.9999999% confidence level of containing test fragments generated during munitions testing. All SAFER-specific munitions testing policies and procedures would be reviewed and approved by safety officials before testing activities commence. Existing SOPs for munitions management would be used when transporting munitions to the SAFER chamber and preparing for testing. No munitions would be stored at the SAFER facility prior to or following detonation events. Once the munitions have been readied for testing, all personnel would be evacuated from the chamber and associated structures. No personnel are permitted to remain on site during detonation testing. The SAFER unit would be operated remotely, and munitions would be detonated from a control building outside the immediate area. ARDEC personnel would follow existing SOPs to ensure safe operation of the unit during munitions testing events.

There is the potential for worker exposure to explosives residue and other contaminants during post-detonation cleanup. To protect human health, SOPs would be developed to detail appropriate processes, schedules, equipment, and personal protection equipment required for workers who collect fragments and clean interior surfaces of the SAFER chamber. The SOP would be reviewed and approved by the Picatinny Arsenal Environmental Affairs Division and an Occupational Medicine Physician prior to commencement of munitions testing within the SAFER facility.

Trespassers are not expected to access the SAFER facility. Picatinny Arsenal is not open to the general public, and access to the 1200 Gorge Test Area is further restricted to prevent contact with unexploded ordnance. Both the installation as a whole and the access-restricted Gorge area are protected by fencing, gated access, and active security. It is unlikely that trespassers would be able to bypass security and gain access to the SAFER facility or surrounding area.

3.13.2 *Environmental Consequences – Human Health & Safety*

No Action Alternative

The No Action Alternative would have adverse impacts on human health and safety, due to the continued requirement to transport experimental munitions to other installations to complete the R&D process. Furthermore, this alternative would hinder ARDEC's ability to safely complete its mission with respect to energetic munitions R&D at Picatinny Arsenal.

Preferred Alternative

Construction. (Minor Impact) Construction of the SAFER facility would have a short-term minor impact on human health and safety. However, all construction activities would adhere to Federal, State, and local worker safety and hazardous material handling requirements. The total estimated time to complete construction of the SAFER facility is six months. Construction-related risks to human health and safety would not be expected to continue after this time. Because the UXO support contractor would clear the SAFER site and accompany construction personnel, risks associated with UXO would be minimized.

Pursuant to the requirements of OSHA, as codified in 29 CFR Section 1926.501(b)(7)(i), workers must be protected from falls around any excavation where the vertical drop exceeds six feet. Schematics provided in Figures 2-1 and 2-2 of this EA call for significantly greater drops (i.e., as much as 52 feet) along the SAFER access ramps and around the faceup area. Accordingly, temporary fencing would be installed on the existing ground surface around the SAFER excavation and unprotected edges to protect on-site workers from falls during excavation and construction activities.

Operations. (Minor Impact) Picatinny Arsenal supports the Army IM Program by conducting explosives safety projects to develop and test munitions modifications that may reduce explosive hazards posed by those munitions items. In this way, high power munitions testing conducted at Picatinny Arsenal improves safety and survivability for the Soldier in the field.

The SAFER facility has been designed as a fully enclosed, underground test chamber capable of achieving ARDEC's fragment capture requirement. Vertical ventilating stacks would be equipped with filters and fans to insure that fragments do not leave the facility. Hanging blast doors would be installed to ensure that high speed fragments do not leave the facility, while also minimizing concussive forces acting on the roof. These facility features would provide protection against potential injury to Arsenal personnel and the general population as a result of detonation blast and fragment ejection. Comprehensive SOPs would be implemented to ensure worker safety during munitions handling, testing, and post-detonation cleanup.

Based on this evaluation, operation of the SAFER facility for munitions testing would have only minor impacts on human health and safety. The SAFER would meet the mission-critical need of serving as an experimental site for fragmenting munitions while ensuring containment of blast and fragmentation effects within the facility. The SAFER would be a beneficial impact to safety, by eliminating the need to conduct open air detonation, given testing would occur in a confined, underground chamber.

As stated previously, pursuant to the requirements of OSHA, as codified in 29 CFR Section 1926.501(b)(1), once SAFER construction is complete, temporary fencing would be installed on the existing ground surface around the access ramps and faceup area. The fencing would provide ongoing protection against falls by on-site workers throughout the SAFER's operational lifetime. Periodic inspection and maintenance of the fencing would be provided by Picatinny Arsenal personnel.

4.0 CUMULATIVE IMPACTS ASSESSMENT

4.1 Introduction

The CEQ regulations under NEPA define cumulative effects as “the impact on the environment which results from the incremental consequences of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.” This chapter documents the analysis of potential cumulative impacts of the Proposed Action in accordance with NEPA (42 USC 4321-4347) CEQ regulation (40 CFR Parts 1500-1508), Army Regulation (32 CFR part 651), and CEQ’s *Considering Cumulative Effects under the National Environmental Policy Act* (1997).

4.2 Cumulative Impact Analysis Methodology

The cumulative impact analyses for both alternatives focuses on impacts on the environment resulting from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. The No Action Alternative represents the existing state. Past and present actions are accounted for in the description of the affected environment for each resource and include the construction of projects identified in the 2008 Picatinny Real Property Master Plan Programmatic EA (Picatinny Arsenal, 2008a). Past, present, and reasonably foreseeable future actions were identified as contributors to cumulative effects in the Picatinny Arsenal region of influence.

This cumulative impact analysis also considers past, present, and reasonably foreseeable future actions that occur as part of other Federal, state, and local projects outside of Army actions. Later in this section is a detailed list of each project along with a project description, project location, and the proponent for each action. Table 4-1 summarizes the cumulative impacts of the two alternatives at the Picatinny Arsenal Gorge Test Area. These ratings take into account the cumulative effects of the current state, as well as the additional impacts of this proposed action and reasonably foreseeable actions.

Table 4-1. Summary of Cumulative Impact Ratings for Alternative Scenarios

Resource Area	Preferred Alternative	No Action Alternative
Land Use & Utilities	Short-term, indirect, minor adverse impacts during construction	No Impact
Traffic & Transportation	Short-term, minor increase in traffic volume on a relatively limited number of days during construction	No Impact
Noise & Vibration	Short-term, minor noise and vibration impacts during construction; however, noise and vibration impacts are anticipated to decrease during operation of the SAFER	No Impact

Resource Area	Preferred Alternative	No Action Alternative
Air Quality	Temporary, direct, minor adverse impact on the local airshed during construction	Long-term, minor, indirect impacts on regional air quality from the increased use of fossil fuels used to transport materials and associated greenhouse gas (GHG) emissions
Geology & Soils	Short-term, direct, minor adverse impacts to the soil during construction with Mitigations to decrease sedimentation	No Impact
Water Resources	Short-term, direct, moderate adverse impacts to groundwater and surface water with Mitigations	No Impact
Wetlands	Long-term, indirect moderate adverse impacts to the wetland transition area	No Impact
Biological Resources	Short-term, direct, moderate adverse impacts with Mitigations	No Impact
Cultural Resources	No impact	No Impact
Hazardous Waste & Hazardous Materials	Long-term, direct, minor adverse impact	No Impact
Socioeconomics & Environmental Justice	Short-term, beneficial, direct impact	No Impact
Human Health & Safety	Short-term, direct, minor adverse impacts; however, beneficial impact to safety, as it would eliminate the need for open air detonation and the transportation of experimental munitions on public roadways	Adverse impacts due to the need to transport experimental munitions to other facilities

Table 4-2 lists military-specific projects related to the mission and Garrison operations on the installation (Picatinny Arsenal, 2008a).

Table 4-2. Military Projects Related to the Mission and Garrison Operations

Project ID#	Project Title	Project Description	Project Year
51519	Ballistics Evaluation Center	Locate interim facility at Building 647 site, full capability at Building 636 site	2012
63054	Explosive Ordnance (XO) Disposal Technology Facility	Multiple locations in 1000 and 1300 Building number areas	2012
65051	Soft Recovery System Facility	Locate off Nicholls Road in the 600 Building number area	2012

Project ID#	Project Title	Project Description	Project Year
64987	Explosive Machining and Prototyping Facility	ARDEC has a pressing need for adequate space to accommodate its explosive machining and milling operations. At Picatinny, all of the explosives that are loaded into shells, projectiles, or other devices must be milled and machined to exacting tolerances. This function is accomplished using computer-controlled numerical comparator (CNC) lathes and milling machines located in Building 225 and controlled remotely from Building 224	2010
65327	Armament Integration Facility	18,250 SF of space for a 100-meter indoor range and associated laboratory	2007
N/A	Enhanced Use Leasing	Under its enhanced use lease initiative, InSitech, a partnership intermediary representing ARDEC's business interests, plans to redevelop and lease buildings 350, 352, 353, and 354 to mission-related tenants. According to the RPI, these buildings provide 58,125 SF of administrative space (out of a total area of 99,305 SF) that will no longer be available to satisfy the requirements of the Garrison and assigned units, since it is leased to private-sector firms.	Ongoing
48465	Emergency Services Center Phase II	The post fire station is located on Navy Hill in a former horse stable that was constructed in 1931 and has been determined eligible for the NHRP. The police station is located in downtown and was constructed in 1941. Neither structure adequately supports the personnel and equipment assigned to the fire and police departments. Accordingly, a combined facility is needed in which to centrally collocate all of the Garrison's emergency services staff and equipment	2009
00621	Vehicle Maintenance Facility	The DOL vehicle maintenance shop is located in Building 33, which was constructed in 1933. During the most recent update of the ISR, Building 33 was evaluated as C-4 and C-3, respectively, for Mission and Quality. From a land use planning perspective, the shop's location is incompatible with adjacent family housing and downtown administrative uses. A 20,000 SF vehicle maintenance shop, properly sited in a maintenance area, is needed to provide adequate space for the maintenance and repair of the Garrison's vehicle fleet. DOL vehicle maintenance is an Essential Facility Requirement.	2010
55524	Child Development Center	Picatinny has an excellent Child Development Center (CDC); however, the child care program has a documented requirement for an additional 90 children who currently are on the CDC's waiting list. In addition, the youth center operates from a C-3 quality building that was constructed in 1932. An Army standard-design Child Development/School Age Services Center is required to provide space for infants, toddlers, preschool, and kindergarten children; the family child care office and lending library; central registration, resources and referral; and child and youth services liaison education and outreach services. Child development center is an	2007

Project ID#	Project Title	Project Description	Project Year
		Essential Facility Requirement.	
56918	Child Development/ School Age Services Center	Locate on the opposite side of Schrader Road from Building 3159	2010
52848	Dam Upgrades	The dams on Picatinny Lake and Lake Denmark are Class I High Hazard Dams. Federal and State requirements dictate that the dams' spillways be capable of passing a 100-year flood and the embankments be armored to allow floodwaters to safely overflow the dam. Prior engineering studies have concluded neither dam meets is capable of meeting these requirements. Accordingly, there is an urgent requirement to upgrade both dams to meet Federal guidelines and State of New Jersey law concerning dam safety	2011
65425	Packaging, Handling, Storage, and Transportation (PHS&T) Center	A 49,350 SF PHS&T Center and outdoor test area are required to accommodate Navy personnel and mission being realigned from Earle, New Jersey.	2011
65426	Fuze Engineering Complex	The renovation of 14,035 SF of space in Building 6 and the construction of an additional 31,140 SF of Fuze laboratory, explosives research laboratory, Fuze engineering and electro-magnetic research laboratory is needed to accommodate Army personnel and mission being realigned from the Adelphi Laboratory Center, Maryland.	2011
65427	Guns and Weapons Systems Technology Data Facility	The renovation of 4,000 SF of operations space and the construction 14,190 SF of engineering work space is required for Navy personnel and missions being realigned from Crane, Indiana; China Lake, California; and Fallbrook, California.	2011
65525	Guns and Weapons Systems Laboratory	A 15,000 SF high bay testing area, 55,000 SF administration building, 28,867 SF warehouse, and 17,634 SF maintenance shop are needed to accommodate personnel and mission being realigned from Louisville, Kentucky.	2011
65527	Explosive Storage Magazines	Twelve standard-design, earth-covered magazines are required to support the ammunition storage requirements of the realigned missions.	2011

Some of these actions are current ongoing projects, while others are expected to commence and completed in the foreseeable future. The following sections describe the potential cumulative impacts to each valued environmental component if the Preferred Alternative were implemented.

4.3 No Action Alternative

The No Action Alternative would have negative impacts on the mission at Picatinny Arsenal. Without the SAFER ARDEC could not meet its current and future explosive and IM R&D mission requirements.

4.3.1 *Preferred Alternative*

This analysis determined the proposed action of building and operating the SAFER would have a minor cumulative impact on the environmental components identified in this assessment. The fully enclosed underground chamber would provide an increased level of public safety for explosive testing and result in increased operational testing as a long term positive impact.

The following subject areas were evaluated for cumulative effects because they have the potential to contribute to cumulative effects, based on the preceding Real Property Master Plan Programmatic Environmental Assessment analyses (Picatinny Arsenal, 2008a).

4.3.1.1 Land Use and Utilities

Construction and operation of the SAFER would have minor impacts to existing and future land use plans. To meet minimum safety requirements and minimize disruption to the general public, explosive testing facilities at Picatinny Arsenal are commonly situated in remote locations away from the installation's cantonment area, the installation's boundary, and the general public. During the construction phase of facility-wide projects, there may be a need to establish a temporary refuse storage area. However, construction activities would pose a minor impact on land use.

There would be a minor cumulative impact associated with the operational phase requirements for needed utilities supply (e.g., electric, water) to support testing and SAFER personnel. Minor increases due to the demand for electricity and water needed to operate the SAFER would have minimal impact to the overall demand of the installation.

4.3.1.2 Traffic and Transportation

Building and operating the SAFER is expected to have minor impacts on traffic and transportation during the construction period when considered among the additional construction projects listed in Table 4-2. Traffic congestion on roadways leading to Picatinny Arsenal, specifically NJ Route 15, could worsen if there were other construction projects on the installation simultaneously, or additional growth or development at or around the installation that would increase peak-hour traffic volume on Route 15.

As noted in Section 3.3, there would be an increase in traffic volume during the estimated six-month construction period coupled with other development projects being constructed at the same time. Operation of the SAFER would not generate any additional traffic volume nor affect any future development projects. Additional traffic volume during the construction period could potentially increase traffic congestion during peak hours and decrease the level of service in the short term.

To minimize this potential impact from constructing the SAFER and other current development projects, the installation could request/require contractors ensure deliveries are made to avoid travel during peak travel hours, or evaluate alternative routes that could be used by construction-related vehicles. Overall cumulative impacts of building the SAFER on traffic would be minor.

4.3.1.3 Noise and Vibration

Minor increases in noise levels would be experienced during the construction phase of the SAFER. Significant noise levels could be experienced during blasting events (ANFO use). Other construction noise would generally be localized in the vicinity surrounding the SAFER during normal daily business hours. There would be no cumulative effects to noise during the six-month construction period since the majority of the construction would be performed underground. The SAFER is a fully enclosed facility. It is expected that a significant portion of the noise energy generated from explosive testing would remain inside the SAFER, resulting in significant reduction in the level of noise leaving the test range. Cumulative impacts to noise are not expected to be significant, as the primary nature of future proposed development on the installation would not require live-fire exercises. The safety easements held by the installation would remain indefinitely to prevent encroaching development within high noise zones.

4.3.1.4 Air Quality

Building the SAFER is expected to have moderate impact on air quality from emissions generated during blasting, excavation, and construction vehicles. Additional emissions from other sources, such as traffic or point sources could decrease air quality in the immediate area during the construction period. Explosive testing inside the fully enclosed SAFER would contain a vast portion of the residue and unexploded constituents within the SAFER. Additionally, the design would significantly reduce the level of emissions from explosive testing during the operational life of the facility. Impacts to air quality from other development activities would be primarily generated from demolition and clearing, and construction of new buildings, as well as modifications and upgrades of older buildings and roadways. Temporary, adverse air quality impacts may result from demolition and construction activities. However, the replacement of old outdated buildings and technology with newer, more efficient sustainment systems may result in a net improvement of the air quality.

4.3.1.5 Geology and Soils

The impact to geologic features would be minor and occur during the ANFO blasting events, excavation, and leveling for the proposed facility. The excavation of the chamber entrance, tunnels, and test chamber would require a significant amount of subterranean rock to be removed to accommodate the entire facility. Soil removal and clearance would be required to construct aboveground entrance paths and other ancillary support elements outside of the underground chamber. Cumulative impacts would only occur if other development projects were to occur within or immediately adjacent to the site of the proposed action, or if development on the site affected geologic resources of sites where other development may occur. Because there are current or proposed future actions scheduled to occur within or adjacent to the proposed SAFER, cumulative impacts associated with soil erosion may occur. Temporary silt fencing would be installed to minimize erosion from traffic and construction-related activities. Additional mitigations may be implemented, if needed and as specified in the Erosion and Sediment Control Plan.

4.3.1.6 Water Resources

The results of the analysis indicate that if the SAFER is constructed consistent with conditions and methods provided by CPI and an effective dewatering plan is in place, the environmental impacts to surface water would be within acceptable limits for both ammonia and nitrate. Ammonia/ammonium concentrations in the upper bedrock aquifer groundwater below the chamber were modeled to be present in very low, undetectable quantities. Building and operating the SAFER is expected to have a moderate impact on water resources at Picatinny Arsenal with mitigation. Best management practices would be used during construction to control erosion and limit additional sediment to surface waters. Air emissions from ANFO blasting and explosive tests would largely remain within the SAFER and significantly reduce the quantity of unexploded explosive constituents distributed on the soil surface around the test site. Impacts to water resources would not be significantly impacted by cumulative development at the Arsenal and within the region. Development restrictions, in the form of easements, directly adjacent to areas of the installation and the mature nature of housing and development in other adjacent areas indicate that substantial future development around the perimeter, with accompanying runoff and sedimentation concerns, would be unlikely. Impacts from development on post are not expected to be significant.

4.3.1.7 Wetlands

The proposed SAFER facility would have moderate impact on freshwater wetlands or State Open Waters. Cumulative impacts associated the SAFER and other development projects would most likely occur within wetland transition areas. Wetlands at Picatinny have not been delineated except for isolated project sites. Construction and/or other disturbances within transitional buffer zone may require wetland permitting, a mitigation plan, and stream encroachment permitting by NJDEP and/or a USFWS consultation. Actions associated with the SAFER and other development projects may require mitigation measures, such as setting aside other land for transitional buffers or establishing replacement wetlands. Wetlands would be delineated to identify the location, transitional zone buffers, riparian corridors, stream encroachment areas, and flood plains. It is estimated the SAFER project would disturb approximately 0.04 acres of wetlands transitional area. Several projects in conjunction with the SAFER may have a moderate cumulative impact within wetland transition areas, including a Ballistics Evaluation Center, a Soft Recovery System Facility, an Experimental Evaluation Facility, dam upgrades, and an Explosive Ordnance Disposal Technology Facility (Picatinny Arsenal, 2008a).

4.3.1.8 Biological Resources

Cumulative impacts associated with past, present, and future actions at Picatinny Arsenal for biological resources would not be significant. There is the potential for wildlife species to be displaced through loss of habitat, dust, erosion, and/or noise. The planned cutting/clearing of trees for the SAFER project would be completed outside of the seasonal occupation of sensitive habitats. As current and future actions are implemented, continual consideration of wildlife habitats for species, such as the Indiana bat, would have to be avoided by the use of zones of concern and/or monitoring programs. Adherence to the installation's standards and guidelines for managing the Indiana bat habitat and other sensitive habitats would ensure cumulative impacts do not become significant. Consultation with USFWS would be conducted if any cutting occurred within the zone of concern.

4.3.1.9 Cultural Resources

Picatinny Arsenal contains a significant number of historical buildings that are protected in accordance with Federal legislation and U.S. Army regulations. NHPA, Section 106 requires the installation to consult with SHPO to identify all applicably regulated resources. Cumulative impacts to cultural resources at Picatinny Arsenal are not expected to be significant. Adverse effects to archaeological resources would be averted by avoidance or, if necessary, mitigation through extensive investigation of identified and potential cultural resource areas.

4.3.1.10 Hazardous Waste and Hazardous Materials

The Arsenal is designated a NPL site by EPA per the CERCLA of 1980. The most widespread contaminants of concern include volatile organic compounds, semi-volatile organics, metals, Trichloroethylene, polychlorinated biphenyl, benzo(a)pyrene, nitroaromatics, explosives, unexploded ordnance, propellants, radiological material, and pesticides. Media of concern for exposure pathways and transport include groundwater, soil, and sediment. Minor amounts of hazardous waste (ANFO and POLs) could potentially be generated during the construction of the SAFER and other facilities. Use of hazardous materials would be managed with prescribed installation SOPs that comply with the RCRA requirements. Operation the SAFER would potentially generate waste that may be hazardous resulting from collection of the explosive residue from the interior surfaces of the SAFER chamber. Operating the SAFER would have no cumulative impact on the installation's hazardous waste operations and procedures or the installation's license to generate and manage hazardous waste.

4.3.1.11 Socioeconomics and Environmental Justice

The construction associated with the SAFER and other development projects would likely provide a positive short-term impact on the local economy through creating construction jobs and facility personnel needed to operate the facility. Operating the SAFER would not increase the full-time/long-term population of installation. Current and future developments projects would have no cumulative adverse impact on socioeconomics of the area.

4.3.1.12 Human Health and Safety

Construction activities of the SAFER and other development projects would adhere to Federal, State, and local worker safety and hazardous material handling requirements. UXO support would oversee any clearing of land and manage minimize risks associated with UXO. The total estimated time to complete construction of the SAFER facility is six months. Construction-related risks to human health and safety would not be expected to continue after this time. Proposed actions from the SAFER project and other development projects may potentially create isolated short-term impacts to on-site workers through various exposure pathways. The use of high explosives during the construction phase and explosive testing during the operational phase present known occupational hazards to facility personnel. The fully enclosed test chamber provides and additional safety factor that would limit the potential for the general public from being impacted by any potential mishaps. Construction sites for the SAFER and other development projects, as well as their respective operational personnel activities, would be managed by a health and safety management plan that meets OSHA and industry standards to protect human health and safety.

5.0 SUMMARY OF CONCLUSIONS

ARDEC prepared this EA to evaluate the potential environmental consequences from constructing and operating an underground testing facility (i.e., SAFER) within the Gorge Test Area at the Picatinny Arsenal. The proposed design for the SAFER chamber includes concrete floors lined with a geo-liner to eliminate the potential migration of munitions constituents or combustion byproducts from contact with groundwater below the facility. The SAFER would also have blast doors to prevent munitions fragments from exiting the chamber.

Three alternative designs were considered and ultimately rejected because they did not meet the operational criteria required for this project. Additional site locations for the SAFER were analyzed at Picatinny Arsenal, but were also discarded from further evaluation due to potential inability to reduce threats of contamination or exposure to the natural environment. These additional site locations were also eliminated due to excessive costs that, if implemented, would not present any additional protection above what is proposed under the Preferred Alternative. The EA also evaluated a No Action Alternative for not constructing the SAFER. The following table summarizes the potential impacts to the human and natural environment from constructing and operating the SAFER at the Arsenal.

Table 5-1. Summary of Direct/Indirect Consequences to Evaluated Resource Areas

Resource Area	Preferred Alternative	No Action Alternative
Land Use & Utilities	Short-term, indirect, minor adverse impacts during construction	No Impact
Traffic & Transportation	Short-term, minor increase in traffic volume on a relatively limited number of days during construction	No Impact
Noise & Vibration	Short-term, minor noise and vibration impacts during construction; however, noise and vibration impacts are anticipated to decrease during operation of the SAFER	No Impact
Air Quality	Temporary, direct, minor adverse impact on the local airshed during construction	Long-term, minor, indirect impacts on regional air quality from the increased use of fossil fuels used to transport materials and associated greenhouse gas (GHG) emissions
Geology & Soils	Short-term, direct, minor adverse impacts to the soil during construction with Mitigations to decrease sedimentation	No Impact
Water Resources	Short-term, direct, moderate adverse impacts to groundwater and surface water with Mitigations	No Impact
Wetlands	Long-term, indirect moderate adverse impacts to the wetland transition area	No Impact

Resource Area	Preferred Alternative	No Action Alternative
Biological Resources	Short-term, direct, moderate adverse impacts with Mitigations	No Impact
Cultural Resources	No impact	No Impact
Hazardous Waste & Hazardous Materials	Long-term, direct, minor adverse impact	No Impact
Socioeconomics & Environmental Justice	Short-term, beneficial, direct impact	No Impact
Human Health & Safety	Short-term, direct, minor adverse impacts; however, beneficial impact to safety, as it would eliminate the need for open air detonation and the transportation of experimental munitions on public roadways	Adverse impacts due to the need to transport experimental munitions to other facilities

Several SAFER design considerations were adopted throughout the development of this EA as a necessary means to eliminate potential environmental hazards. Through in-depth studies, including snake surveys and groundwater modeling and studies, mitigation measures are proposed to minimize or eliminate any adverse effects. BMPs have been identified to further reduce any adverse impacts. All mitigation measures are displayed by resource area analyzed in Table 5-2. These mitigation measures must be adopted to mitigate potentially severe or significant environmental consequences down to a rating of moderate impact(s).

Table 5-2. Mitigations

Direct Effect	Mitigation	Regulatory and Administrative Drivers	Benefit of Mitigation
Land Use & Utilities – N/A			
Traffic & Transportation – N/A			
Noise & Vibration – N/A			
Air Quality – N/A			
Geology & Soils			
Minor impact on Green Pond Brook from construction-related traffic, potentially increasing sediment loads	Install temporary silt fences to minimize traffic and construction-related erosion. In addition, implement additional measures as specified in the Erosion and Sediment Control Plan to be approved by the Morris County Soil Conservation District.	CWA	This mitigation would help preserve water quality along this Category One waterway and minimize impacts to brook trout and other Green Pond Brook inhabitants.
Water Resources			
Moderate impact with mitigation measures needed to avoid impacts to groundwater quality above water quality standards from SAFER construction activities	The dewatering contractor will develop mitigation measures, possibly to include obtaining a dewatering permit. Based on the results of the hydrogeologic study, dewatering may be needed to prevent contact between residual explosives and local groundwater during construction.	CWA	These mitigations will minimize the potential for groundwater contamination resulting from excavation of the preferred SAFER site.
Moderate impact regarding the potential migration of nitrogen compounds resulting from residual explosives (e.g., ammonium nitrate/fuel oil [ANFO]) on excavation floor following blasted rock removal, and in soil stockpiles where blasted rock will be placed during construction	The mining contractor will be required to demonstrate and provide evidence that its methodology is at least 96% effective for consuming residual ANFO during blasting. If required, the mining contractor will develop mitigation measures for any remaining residual ANFO on the rock to be transported to the rock storage areas. A monitoring program will be developed prior to construction, and monitoring wells will be used to periodically assess ANFO concentrations and potential impacts on groundwater quality.	CWA	These mitigations will minimize release of ANFO into the environment and potential for impacting surface water directly or indirectly via groundwater.

Direct Effect	Mitigation	Regulatory and Administrative Drivers	Benefit of Mitigation
Inadequate monitoring could lead to discharge of contaminated groundwater to Green Pond Brook	Conduct sampling and analysis in accordance with the monitoring plan (baseline, construction, and operation) to ensure maintenance of water quality in Green Pond Brook. Monitoring wells will be installed and sampled downgradient of the SAFER site prior to construction to supplement the existing groundwater monitoring well network. The monitoring plan will include periodic monitoring of groundwater emanating from the SAFER to assess the effectiveness of mitigation measures. Additional controls will be implemented, as necessary, based on monitoring results and permitting requirements.	CWA	This mitigation will minimize impacts to Green Pond Brook.
Erosion and sediment loading along Lower Gorge Road and Upper Gorge Road may impact Green Pond Brook during construction of the SAFER facility	Install temporary silt fences to minimize traffic and construction-related stream sedimentation. In addition, implement additional measures as specified in the Erosion and Sediment Control Plan to be approved by the Morris County Soil Conservation District.	CWA	These mitigations will minimize impacts to Green Pond Brook during construction.
Minor impact with SAFER design mitigation	Install a geo-liner beneath the SAFER main chamber to eliminate short-term and long-term migration of munitions combustion byproducts into the groundwater beneath the SAFER site. Install a concrete floor designed with drain to divert any build-up of moisture from the main chamber from transporting munitions combustion byproducts from the SAFER walls to the underlying soils. This floor would be an added measure of protection beyond the geo-liner, and would add stability for equipment transporting munitions to the SAFER chamber for detonation.	CWA	Eliminate the potential for groundwater contamination resulting from long-term operations of the SAFER facility.
Wetlands – N/A			
Biological Resources			
Potential impacts on the Indiana bat and breeding birds during construction of the SAFER facility	Felling of trees at the SAFER site will be limited to the period between 16 November and 31 March. All construction blasting will be prohibited from one hour before sundown to one hour after sunrise from 1 April through 15 November.	ESA	To reduce the potential significance of impacts to moderate for the Indiana bat.

Direct Effect	Mitigation	Regulatory and Administrative Drivers	Benefit of Mitigation
Potential interaction between construction traffic and commonly encountered species, such as wood turtles, box turtles, and snakes	Provide driver training during initial construction worker assignments. Post speed limit signs (15 miles per hour) along Upper Gorge Road.	ESA, Fish and Wildlife Coordination Act (FWCA)	To mitigate impacts during construction due to increased traffic on the access road to the proposed SAFER site.
Potential impacts on the local timber rattlesnake and northern copperhead snake populations during construction of the SAFER facility	All personnel entering the construction site will be educated in identification and hazards of venomous snakes and procedures to be followed if a rattlesnake or copperhead is encountered. If a State-listed snake (i.e., timber rattlesnake, northern copperhead) is sighted during construction or operations, the Picatinny Natural Resource Manager will be notified. Rattlesnakes and copperheads will not be killed or molested. Signage with these prohibitions will be posted at the SAFER site and rock storage areas. Any felled trees and brush will be promptly removed and hauled away, or piled in areas away from construction and rock storage areas, and allowed to remain undisturbed in perpetuity. A minimum cleared buffer of 10 feet with no cover vegetation or rock will be maintained around the rock storage areas to eliminate the open interface habitat that snakes prefer. The use of Rock Storage Area B will be avoided to the extent practicable, particularly during the snakes' active season between 1 April and 31 Oct. If any activities in Rock Storage Area B occur between 1 April and 31 Oct, a NJDEP ENSP-qualified snake monitor will be present for the duration of the activities. The snake monitor will capture and relocate any observed snakes (and other listed wildlife) to an area outside the active workspace, according to NJDEP ENSP protocols. Passage points for snakes and other wildlife will be included in all silt fencing.	NJ Endangered Species Conservation Act (ESCA)	To minimize potential significance of impacts to minor or no impact for these populations.
Potential impacts on the local brook trout population during construction of the SAFER facility	Conduct sampling and analysis in accordance with the monitoring plan (baseline, construction, and operation) to ensure maintenance of water quality in Green Pond Brook. Install temporary silt fences to minimize traffic and construction-related erosion. Additional controls will be implemented if necessary based on monitoring results and permitting requirements (e.g., Erosion and Sedimentation Control Plan).	FWCA	To minimize potential significance of impacts to minor or no impact for this species.

Direct Effect	Mitigation	Regulatory and Administrative Drivers	Benefit of Mitigation
Cultural Resources – N/A			
Hazardous Wastes & Hazardous Materials – N/A			
Socioeconomics & Environmental Justice – N/A			
Human Health & Safety – N/A			

Note: ARDEC will monitor implementation of all mitigation measures identified in this EA in accordance with CEQ's guidance, "Appropriate Use of Mitigation, Monitoring, and Mitigated FONSIs" (CEQ, January 2011).

6.0 GLOSSARY

As adapted from the *Army NEPA Glossary* (AEC, 2006)

Term	Definition
Affected Environment	A portion of the NEPA document that succinctly describes the environment of the area(s) to be affected or created by the alternatives under consideration *[40 CFR §1502.15]*
Alternative	A reasonable way to fix the identified problem or satisfy the stated need *[40 CFR §1502.4]*
Baseline	The existing environmental conditions against which impacts of the proposed action and its alternatives can be compared
Best Management Practices (BMPs)	Structural, nonstructural, and managerial techniques, other than effluent limitations, to prevent or reduce pollution of surface water. They are the most effective and practical means to control pollutants that are compatible with the productive use of the resource to which they are applied
Critical Habitat	For listed species [critical habitat] consists of: (1) the specific area(s) within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of the [Endangered Species] Act, on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific area(s) outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the [Endangered Species] Act, upon a determination by the Secretary [of the Department of Interior] that such areas are essential for the conservation of the species. Designated critical habitats are described in 50 CFR §17 and §226
Cultural Resources	Historic properties as defined by the NHPA, cultural items as defined by NAGPRA, archeological resources as defined by ARPA, sacred sites as defined in EO 13007 to which access is afforded under AIRFA, and collections and associated records as defined in 36 CFR 79
Cumulative Effect (Cumulative Impact)	The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time *[40 CFR §1508.7]*
Decibel (dB)	A unit for expressing the relative intensity of sounds on a logarithmic scale from zero for the average least perceptible sound to about 130 for the average level at which sound causes pain to humans
Effects	*Effects* and *impacts*, as used in NEPA, are synonymous. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. There are direct effects and indirect effects: a. Direct effects are caused by the action and occur at the same time and place. b. Indirect effects are caused by the action and are later in time or farther removed in

Term	Definition
	distance, but are still reasonably foreseeable *[40 CFR §1508.8]*
Endangered Species	Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations *[50 CFR §424]*
Environmental Assessment (EA)	a. A concise public document for which a Federal agency is responsible that serves to: 1. Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact. 2. Aid an agency's compliance with NEPA when no EIS is necessary. 3. Facilitate preparation of an EIS when one is necessary. b. Include brief discussions of the need for the proposal, alternatives, the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted *[40 CFR §1508.9]*
Environmental Consequences	Environmental effects of project alternatives, including the proposed action, any adverse environmental effects which cannot be avoided, the relationship between short-term uses of the human environment, and any irreversible or irretrievable commitments of resources which would be involved if the proposal should be implemented *[40 CFR §1502.16]*
Finding of No Significant Impact (FNSI or FONSI)	A document by a Federal agency briefly presenting the reasons why an action, not otherwise excluded (40 CFR §1508.4), will not have a significant effect on the human environment and for which an environmental impact statement therefore will not be prepared *[40 CFR §1508.13]*
Informal Consultation	Under the Endangered Species Act, informal consultations: (a) clarify whether and what listed, proposed, and candidate species or designated or proposed critical habitats may be in the action area; (b) determine what effect the action may have on these species or critical habitats; (c) explore ways to modify the action to reduce or remove adverse effects to the species or critical habitats; (d) determine the need to enter into formal consultation for listed species or designated critical habitats, or conference for proposed species or proposed critical habitats; and (e) explore the design or modification of an action to benefit the species
Insensitive Munitions	Munitions that reliably fulfill (specified) performance, readiness and operational requirements on demand, but which minimize the probability of inadvertent initiation and severity of subsequent collateral damage to the weapon platforms, logistic systems and personnel when subjected to unplanned stimuli
Integrated Cultural Resources Management Plan (ICRMP)	A 5-year plan developed and implemented by an Installation Commander to provide for the management of cultural resources in a way that maximizes beneficial effects on such resources and minimizes adverse effects and impacts without impeding the mission
Integrated Natural Resources Management Plan (INRMP)	The Installation Commander's plan for the management of natural resources, including fish, wildlife, and plants; allow multipurpose uses of resources; and provide public access where appropriate for those uses, without any net loss in the capability of an installation to support its military mission
Mitigation	Planning actions taken to avoid an impact altogether minimize the degree or magnitude of the impact, reduce the impact over time, rectify the impact, or compensate for the impact. Mitigation includes: a. Avoiding the impact altogether by not taking a certain action or parts of an action

Term	Definition
	b. Minimizing impacts by limiting the degree or magnitude of the action and its implementation c. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment d. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action e. Compensating for the impact by replacing or providing substitute resources or environments [40 CFR §1508.20]
No Action Alternative	The alternative where current conditions and trends are projected into the future without another proposed action [40 CFR §1502.14(d)]
Preferred Action	In a NEPA document, this is typically the action that has been selected for implementation by the record of decision after consideration of purpose and need, project and cumulative impacts, and public comments
Proposed Action	A plan that contains sufficient details about the intended actions to be taken, or that will result, to allow alternatives to be developed and its environmental impacts analyzed [40 CFR §1508.23]
Purpose and Need	"Purpose" is a statement of goals and objectives that the installation intends to fulfill by taking action "Need" is a discussion of existing conditions that need to be changed, problems that need to be remedied, decisions that need to be made, and policies or mandates that need to be implemented. In other words, the "need" explains why the installation is proposing this action at this time
Threatened Species	Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the Endangered Species Act and its implementing regulations [50 CFR §424]
Valued Environmental Components (VECs)	Those aspects (components/processes/functions) of ecosystems, human health, and environmental welfare considered to be important and potentially at risk from human activity or natural hazards. Similar to the term "valued environmental components" used in an environmental impact assessment

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Appendix A. Air Quality Analysis Summary

Table A-1: Measured Ambient Concentrations in Vicinity of Picatinny Arsenal (Morris County)

Pollutant	Monitor Site	Averaging Period	Year	Measured Concentrations ($\mu g/m^3$)	Primary NAAQS/NJAAQS ($\mu g/m^3$)	Percent of NAAQS/NJAAQS (%)
SO_2	Chester	3-hour	1999	138.6	1300[(a)]	10.7
		24-hour	1999	69.3	365	19.0
		Annual[(b)]	1998-2000	10.7	80	13.3
TSP	Phillipsburg	24-hour	1996	94.0	260	36.2
		Annual[(b)]	1997	40.4	75	53.9
PM_{10}	Clifton	24-hour	1998	63.0	150	42.0
		Annual[(c)]	1998	25.5	50	51.0
$PM_{2.5}$	Morristown	24-hour	2000	32.4	65	49.8
		Annual	2000	12.9	15	86.0
NO_2	Chester	1-hour	1998	130.1	470[(d)]	27.7
		Annual[(b)]	1998, 1999	23.0	100	23.0
CO	Morristown	1-hour	1998	7,340	40,000	18.4
		8-Hour	1999	4,777	10,000	47.8
Pb	New Brunswick	3-month	1999	0.183	1.5	12.2
O_3	Chester	1-hour	1999	237.6	235	101.1

(a) Secondary standard.

(b) Based on 12-month maximum for comparison to NJAAQS; NAAQS based on calendar year value, which is lower than 12-month maximum.

(c) Based on calendar year value for comparison to NAAQS; no comparable NJAAQS.

(d) NJDEP 1-hr guideline value; not an ambient standard.

Table A-2. SAFER Operational Emissions of Criteria Pollutants

Munition Item Tested		20mm	30mm	40mm	60mm M888	60mm M720	81mm M821A1	81mm M889	120mm (tank) M830	120mm M934	105mm M1	155mm M864	155mm M549A1	155mm M549	155mm M795	155mm M107
Explosive Filler		Comp A4	Comp A4	Comp A5	Comp B	Comp B	Comp B	Comp B	Comp B	Comp B	Comp B	Comp A5	TNT	Comp B	TNT	TNT
Explosive Weight (lbs)		0.1	0.1	0.33	0.6	0.6	1.8	1.8	7.6	7.6	5.06	7.4	15	16	23.8	14.6
Items per test		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
# Tests per Year		240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
NEW per Year		144	144	475.2	864	864	2592	2592	10944	10944	7286.4	10656	21600	23040	34272	21024
Emissions by Pollutant	**NOx**	0.00	0.00	0.00	8.20	8.20	24.61	24.61	103.90	103.90	69.18	0.00	225.94	241.00	358.49	219.91
	Pb	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.04	0.04	0.02	0.08	0.08	0.08	0.12	0.07
	CO	4.09	4.09	13.50	3.63	3.63	10.89	10.89	45.96	45.96	30.60	302.63	1447.20	1543.68	2296.22	14.73
	SO_2	0.00	0.00	0.00	0.11	0.11	0.34	0.34	1.42	1.42	0.95	0.00	3.05	3.25	4.83	0.00
	PM_{10}	90.00	90.00	297.00	10.63	10.63	31.88	31.88	134.61	134.61	89.62	6660.00	2008.80	2142.72	3187.30	1.37
	$PM_{2.5}$	33.30	33.30	109.89	3.93	3.93	11.80	11.80	49.81	49.81	33.16	2464.20	743.26	792.81	1179.30	0.51

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EPA/DPG BB 1998 (Sandia NL)

(a): $PM_{2.5}$: Relative ratio of PM2.5 to PM 10 is 0.37 for Operational Emissions. (Based on Nevada Test Site particulate data using 155mm rounds)

Generator Emission Summary

Pollutant	Emission Factor[1]		Rating					
	gr/bhp-hr	lb/bhp-hr	Hp	hr/day	days/yr	hr/yr	bhp-hr/yr	lb/yr
NO_x	2.61	3.73E-04	126	8	270	2,160	272,160	1,566.0
HC/VOC	0	0	126	8	270	2,160	272,160	0
CO	1.19	1.70E-04	126	8	270	2,160	272,160	714.0
PM	0.15	2.15E-05	126	8	270	2,160	272,160	90.0

Table A-3. Open Burning/Open Detonation Emission Factors

OB/OD Emission Factors		EF	NOx	EF Reference
Comp B	NO	9.30E-03	9.49E-03	EPA/DPG BB 1998
	NO_2	1.94E-04		EPA/DPG BB 1999
	Pb	3.23E-06		SERDP/DPG BB 1998
	CO	4.20E-03		EPA/DPG BB 1999
	SO_2	1.30E-04		EPA/DPG BB 2000
	PM_{10}	1.23E-02		SERDP/DPG BB 1998
	$PM_{2.5}$	(a)		
TNT	NO	9.70E-03	1.05E-02	EPA/DPG BB 1998 (Sandia NL)
	NO_2	7.60E-04		EPA/DPG BB 1999 (Sandia NL)
	Pb	3.47E-06		SERDP/DPG BB 1998
	CO	6.70E-02		EPA/DPG BB 1999
	SO_2	1.41E-04		SERDP/DPG BB 1998
	PM_{10}	9.30E-02		EPA/DPG BB 1999
	$PM_{2.5}$	(a)		
Comp A5	NO	0	0	
	NO_2	0		
	Pb	7.42E-06		SERDP/DPG BB 1998
	CO	2.84E-02		SERDP/DPG BB 1999
	SO_2	0.00E+00		
	PM_{10}	6.25E-01		SERDP/DPG BB 1999
	$PM_{2.5}$	(a)		

Table A-4. Construction Equipment (non/off-road) Emissions Summary

	Operational Data				Emission Factors (lb/hr)							Emissions Summary (lbs)						
Equipment	Number of units	Hours per day	Number of days	HP Rating (hp)	ROG	CO	NO_X	SO_X	PM	CO_2	CH_4	ROG	CO	NO_X	SO_X	PM[2]	CO_2	CH_4
Air Compressor	1	6	189	400	0.194	0.678	2.206	0.002	0.075	231.742	0.018	220.0	768.9	2,501.6	2.3	85.1	262,795.4	20.4
Drill Jumbo	1	6	189	250	0.096	0.346	1.185	0.002	0.038	188.102	0.009	108.9	392.4	1,343.8	2.3	43.1	213,307.7	10.2
Grader	1	6	84	220	0.176	0.493	1.790	0.002	0.066	172.113	0.016	88.7	248.5	902.2	1.0	33.3	86,745.0	8.1
Water Truck	1	6	179	275	0.176	0.493	1.790	0.002	0.066	172.113	0.016	188.5	528.0	1,917.1	2.1	70.7	184,333.0	17.1
Pressure Washer	1	6	189	50	0.041	0.114	0.139	0.000	0.011	14.296	0.004	46.5	129.3	157.6	0.0	12.5	16,211.7	4.5
Skid Steer	1	6	84	128	0.061	0.282	0.413	0.001	0.036	42.762	0.005	30.7	142.1	208.2	0.5	18.1	21,552.0	2.5
Loader	1	6	84	220	0.142	0.404	1.549	0.002	0.052	171.737	0.013	71.6	203.6	780.7	1.0	26.2	86,555.4	6.6
Beetle Drill(1)	1	6	189	90	0.146	0.465	0.822	0.001	0.079	62.036	0.013	165.6	527.3	932.1	1.1	89.6	70,348.8	14.7
ANFO Loader(1)	1	6	84	160	0.152	0.582	1.136	0.001	0.068	95.932	0.014	76.6	293.3	572.5	0.5	34.3	48,349.7	7.1
Roof Bolter(1)	1	6	189	250	0.140	0.368	1.502	0.002	0.051	135.584	0.013	158.8	417.3	1,703.3	2.3	57.8	153,752.3	14.7
											Totals:	1,155.8	3,650.7	11,019.1	13.1	470.6	1,143,951.0	106.0

(1) Emission factor for 'General Industrial Equipment' was used as a surrogate.

(2) Emission Factors obtained from the SCAQMD off-road Emission factor database for CY 2010.

(3) Increased number of days by 5% to account for emissions from operations from rock feasibility study.

Table A-5. Construction Vehicles (off-site/on-site) and Equipment Emission Factors

Vehicle Type	CO Emissions Factor (lb/mile)	VOC Emissions Factor (lb/mile)(3)	NOx Emissions Factor (lb/mile)	SOx Emissions Factor (lb/mile)	PM_{10} Emissions Factor (lb/mile)	$PM_{2.5}$ Emissions Factor (lb/mile)	CO2 Emissions Factor (lb/mile)	CH4 Emissions Factor (lb/mile)
Worker Vehicles (1)	0.01282	0.001383	0.001361	0.000009	0.00008	0.000006	13.00522	0.00112
Pickup Trucks (1)	0.01282	0.001383	0.001361	0.000009	0.00008	0.000006	26.01043	0.00224
Delivery Trucks(1)	0.017455	0.002608	0.024978	0.000033	0.00044	0.000012	---	---
Stakebed Trucks(1)	0.017455	0.002608	0.024978	0.000033	0.00044	0.000012	---	---
Flatbed Trucks(1)	0.017455	0.002608	0.024978	0.000033	0.00044	0.000012	---	---
Dump Trucks(2)	0.00552	0.001227	0.035635	0.0000457	0.000644	0.000418	21.67536	0.00186
Cement Trucks(2)	0.00552	0.001227	0.035635	0.0000457	0.000644	0.000418	13.00522	0.00112
Equipment	**CO Emissions Factor (g/hr)**	**VOC Emissions Factor (g/hr)(6)**	**NOx Emissions Factor (g/hr)**	**SOx Emissions Factor (g/hr)**	**PM_{10} Emissions Factor (g/hr)**		**CO2 Emissions Factor (g/hr)**	**CH4 Emissions Factor (g/hr)**
Skidder(4)	125.0	18.34	339.18	14.09	30.03		71,244.96	---
Chain Saws(5)	0.00552	0.001227	0.035635	0.0000457	0.000644		13.00522	0.00112

(1) Emission factors derived from CARB's EMFAC 2002 (Version 2.2) BURDEN model, Scenario Year 2007, for passenger vehicles and delivery trucks; PM2.5 emission factors from Version 2.3.

(2) Emission factors derived from CARB's EMFAC 2002 (Version 2.2) BURDEN model, Scenario Year 2007, for heavy-heavy duty diesel trucks; PM2.5 emission factors from Version 2.3.

(3) Assumption: VOC = ROG

(4) Emission factors derived from EPA Nonroad Emissions Model Version 2008.1.0 for Forest Eqp - Feller/Bunch/Skidder (SCC 2270007015) 175 <Hp<=300

(5) Emission factors derived from EPA Nonroad Emissions Model Version 2008.1.0 for Forest Eqp - Chain Saws >Hp, 2 stroke (SCC 2260007005)

(6) Assumption: Total THC = VOC

Table A-6. Construction Vehicles (off-site/on-site) Daily Emissions

Source	Parameters					Peak Day Emissions (lbs/day) (2)							
	Number of Days	Number of Vehicles per Day	Trips per Day per Vehicle	Distance Traveled per Trip (miles)	Distance Traveled per Day (1) (miles)	CO	VOC	NOx	SOx	PM_{10}	PM2.5(5)	CO_2	CH_4
Worker Vehicles	180	10	2	20	400	5.13	0.55	0.54	0	0.03	0.0025	5,202.09	0.45
Pickup Trucks	180	2	2	10	40	0.51	0.06	0.05	0	0	0.0003	1,040.42	0.09
Delivery Trucks	0	0	0	0	0	0	0	0	0	0	0	---	---
Stakebed Trucks	0	0	0	0	0	0	0	0	0	0	0	---	---
Flatbed Trucks	0	0	0	0	0	0	0	0	0	0	0	---	---
Dump Trucks	92	6	16	1	96	0.53	0.12	3.42	0.004	0.06	0.04	2,080.83	0.18
Cement Trucks	14	8	1	20	160	0.88	0.20	5.70	0.01	0.10	0.07	2,080.84	0.18
Totals						**7.1**	**0.92**	**9.71**	**0.01**	**0.20**	**0.11**	**10,404.18**	**0.90**

(1) Distance Traveled per Day = Number of Vehicles per Day x Trips per Day per Vehicle x Distance Traveled per Trip

(2) Peak Day Emissions = Emission Factor x Distance Traveled per Day

(3) Assumption: VOC = ROG

(4) Assumption: To move the estimated amount of rock generated (82,000 cubic yd) with 6 trucks (14 cubic yd per truck) making 12 trips per hour in an 8-hr workday, 61 days are needed (5,858 truck trips/96 trips per day). The amount of rock generated per day may not be uniform or the contractor may use less than 6 trucks which would require additional days. The number of days was increased by 50% to account for these potential changes to operations.

Table A-7. Construction Vehicles (off-site/on-site) Total Emissions

Source	Parameters					Total Emissions (lbs)							
	Number of Days	Number of Vehicles per Day	Trips per Day per Vehicle	Distance Traveled per Trip (miles)	Distance Traveled per Day (1) (miles)	CO	VOC	NOx	SOx	PM_{10}	PM2.5(5)	CO_2	CH_4
Worker Vehicles	180	10	2	20	400	923.04	99.58	97.99	0.65	5.76	0.46	936,375.57	80.56
Pickup Trucks	180	2	2	10	40	92.3	9.96	9.8	0.06	0.58	0.05	187,275.11	16.11
Delivery Trucks	0	0	0	0	0	0	0	0	0	0	0	0.00	0
Stakebed Trucks	0	0	0	0	0	0	0	0	0	0	0	0.00	0
Flatbed Trucks	0	0	0	0	0	0	0	0	0	0	0	0.00	0
Dump Trucks	92	6	16	1	96	48.76	10.86	314.64	0.37	5.70	3.69	191,436.73	16.56
Cement Trucks	14	8	1	20	160	141.31	31.41	912.26	1.17	1.44	0.9	332,933.63	28.67
Totals						**1,205.41**	**151.81**	**1,334.69**	**2.25**	**13.49**	**5.13**	**1,648,021.04**	**141.90**

(1) Distance Traveled per Day = Number of Vehicles per Day x Trips per Day per Vehicle x Distance Traveled per Trip

(2) Peak Day Emissions = Emission Factor x Distance Traveled per Day

(3) Assumption: VOC = ROG

(4) Assumption: To move the estimated amount of rock generated (82,000 cubic yd) with 6 trucks (14 cubic yd per truck) making 12 trips per hour in an 8-hr workday, 61 days are needed (5,858 truck trips/96 trips per day). The amount of rock generated per day may not be uniform or the contractor may use less than 6 trucks which would require additional days. The number of days was increased by 50% to account for these potential changes to operations.

(5) Assuming PM2.5 11% of PM10 per "Examination of the Multiplier Used to Estimate PM2.5 Fugitive Dust Emissions from PM10" by Thompson G. Pace, U.S. EPA.

Table A-8. Site Clearing Activities Daily Emissions

Source	Parameters					Peak Day Emissions (lbs/day) (2)						
	Number of Days	Number of Vehicles per Day	Trips per Day per Vehicle	Distance Traveled per Trip (miles)	Distance Traveled per Day (1) (miles)	CO	VOC	NOx	SOx	PM_{10}	CO_2	CH_4
Worker Vehicles	14	4	2	20	160	2.05	0.22	0.22	0.00	0.01	2,080.84	0.18
Source	Number of Days	Number of Vehicles per Day	Trips per Day per Vehicle	Distance Traveled per Trip (miles)	Distance Traveled per Day (1) (miles)	CO	VOC	NOx	SOx	PM_{10}	CO_2	CH_4
Skidder	14	1	2	2	28	7.72	1.13	20.94	0.87	1.85	---	---
Chain Saws(3)	14	4	8	32	448	0.005	0.001	0.035	0.0000	0.001	---	---
Totals						**9.8**	**1.4**	**21.2**	**0.9**	**1.9**	**2,080.8**	**0.2**

(1) Distance Traveled per Day = Number of Vehicles per Day x Trips per Day per Vehicle x Distance Traveled per Trip

(2) Peak Day Emissions = Emission Factor x Distance Traveled per Day

(3) Assuming two two-person teams

Table A-9. Site Clearing Activities Total Emissions

Source	Parameters					Total Emissions (lbs)						
	Number of Days	Number of Vehicles per Day	Trips per Day per Vehicle	Distance Traveled per Trip (miles)	Distance Traveled per Day (1) (miles)	CO	VOC	NOx	SOx	PM_{10}	CO_2	CH_4
Worker Vehicles	14	4	2	20	160	28.7	8.2	4.1	41.0	328.2	58.9	16.8
Source	Number of Days	Number of Vehicles per Day	Trips per Day per Vehicle	Distance Traveled per Trip (miles)	Distance Traveled per Day (1) (miles)	CO	VOC	NOx	SOx	PM_{10}	CO_2	CH_4
Skidder	14	1	2	2	28	108.02	15.85	293.12	12.18	25.95	---	---
Chain Saws(3)	14	22	23	24	25	0.08	0.02	0.49	0.00	0.01	---	---
Totals						**136.8**	**24.1**	**297.7**	**53.2**	**354.2**	**58.9**	**16.8**

(1) Distance Traveled per Day = Number of Vehicles per Day x Trips per Day per Vehicle x Distance Traveled per Trip

(2) Peak Day Emissions = Emission Factor x Distance Traveled per Day

(3) Assuming two two-person teams

Fugitive PM Construction Emission Estimates From Trucks and Employee Vehicles

Table A-10. Fugitive PM Emissions for Vehicles (off/on-site)

Source Type	Number	Fuel	Peak Daily Trips	One-way Distance	Emission Factor (lb/vmt)	Peak PM_{10} (lbs/day)	Total PM_{10} (lbs)	Total $PM_{2.5}$ (lbs)(1)
Passenger Vehicle/On Paved Roadways	10	Gasoline	2	20	0.000856	0.34	61.2	5.51
Pickup Trucks on Paved Roadways	2	Gasoline	2	20	0.0026	0.21	37.8	3.40
Trucks on Paved Roadways	5	Diesel	8	6	0.080917	19.42	3495.6	314.6
Water Truck on Unpaved Roadways	1	Diesel	1	3	1.6	4.80	864	95.04

Total Vehicles from Modified Project	18	Total Emissions lb/day	48.99
Total # days	180	Total PM10 Emissions, lbs	4,797.68
		Total PM2.5 Emissions, lbs	450.4

(1) Assuming PM2.5 11% of PM10 for Unpaved Roads and 10% of PM10 for Paved Roads per "Examination of the Multiplier Used to Estimate PM2.5 Fugitive Dust Emissions from PM10" by Thompson G. Pace, U.S. EPA.

vmt = vehicle miles travelled

* Emission Calculations for travel on paved roads from EPA AP-42 Section 13.2.1

$E = k(sL/2)^{0.65} \times (W/3)^{1.5}$

Where: k = 0.016 lb/VMT for PM10, sL = road silt loading (gms/m2) from CARB Methodology 7.9 for paved roads

(0.240 for local roads and 0.037 for major/collector roads), W = weight of vehicles (2.4 tons for cars; 5 for pickup trucks, and 50 for heavy trucks with 12 cu yards of blasted rock))

**Emission Calculations for travel on unpaved roads from EPA AP-42 Section 13.2.2

$E = 2.6(s/12)^{0.8} \times (W/3)^{0.4}/(M/0.2)^{0.3}$

Where: s = surface silt content (assumed to be 11%, AP-42 Table 13.2.2-1), W = vehicle weight (tons) same assumptions as above, and

M = material moisture content (assumed to be 10 percent since these emissions would only come from a water truck watering the site).

Table A-11. On-site Construction Fugitive PM Emissions (Disturbed Surfaces)

Fugitive - Construction	Peak Acreage Disturbed Per Day	PM10 Emission Factor (pounds/day/acre) (1)	Water Control Factor	Peak Uncontrolled PM_{10} Emissions (pounds/day) (2)	Peak Controlled PM_{10} Emissions (pounds/day) (3)	Peak Uncontrolled PM_{10} Emissions (pounds/yr) (2)	Peak Controlled PM_{10} Emissions (pounds/yr) (3)	Peak Controlled $PM_{2.5}$ Emissions (pounds/yr) (4	SCAQMD Emission Factor Source
Disturbed Surfaces	0.1	26.4	0.5	2.6	1.3	448.8	224.4	22.44	Table A9-9

(1) Emission factor associated with grading activities was used as a "worst-case" (Table A9-9, SCAQMD CEQA Handbook).
(2) Peak Uncontrolled PM10 Emissions (pounds/day) = Peak Acreage Disturbed Per Day x PM10 Emission Factor.
(3) Peak Controlled PM10 Emissions (pounds/day) = Peak Acreage Disturbed Per Day x PM10 Emission Factor x Water Control Factor. Assume watering 3 times per day.
(4) Assuming PM2.5 10% of PM10 per "Examination of the Multiplier Used to Estimate PM2.5 Fugitive Dust Emissions from PM10" by Thompson G. Pace, U.S. EPA.
Number of days: 170

Table A-12. On-site Construction Fugitive PM Emissions (Storage Piles)

WIND EROSION Disturbed Area and Temporary Storage Areas/Sites	Days of Construction	Average Acreage Disturbed Per Day	Peak Acreage Disturbed Per Day	TSP Emission Factor (lb/(acre)(hr))(5)	Average PM_{10} Pounds/day	Peak PM_{10} Pounds/day	Average PM_{10} lbs/Year	Peak PM_{10} lbs/Year	Peak $PM_{2.5}$ lbs/Year	AP-42 Emission Factor Source
Construction Activities	180	0.066	0.1	7.2	11.43	17.28	2,057.74	3,110.4	311.04	Table 11.9-1

Table A-13. On-site Construction Fugitive PM Emissions (Truck Filling and Dumping)

TRUCK FILLING/DUMPING					Controlled Emissions		Uncontrolled Emissions					SCAQMD Emission Factor Source
	Estimated Materials Handled Per Day (tons)	Peak Tons of Materials Handled Per Day	PM_{10} Emission Factor (lb/ton)	Water Control Factor	Average PM_{10} lb/day	Peak PM_{10} lb/day	Average PM_{10} lb/day	Peak PM_{10} lb/day	Average PM_{10} lb/yr	Peak PM_{10} lb/yr	Peak $PM_{2.5}$ lb/yr	
Truck Filling(5)	1,865	1,985	0.02205	0	0	0	41.1	43.8	3,783.4	4,027.5	422.9	Table A9-9
Truck Dumping	1,865	1,985	0.009075	0	0	0	16.9	18.0	1,557.1	1,657.6	174.0	Table A9-9

# of days: 92
(5) Used SCAQMD Table 9-9 Default emission factors.
(6) Used AP-42 emission factor for TSP<30um for active storage piles: 0.72u (u = mean windspeed, (10 mph)). All TSP assumed to be PM_{10}

TOTAL PM_{10} (lbs)	Average	Peak
(Controlled Emissions)	----	224.4
(Uncontrolled Emissions)	7,398.3	9079.8
TOTAL $PM_{2.5}$ (lbs)	Average	Peak
(Controlled Emissions)	----	22.44
(Uncontrolled Emissions)	----	908.0

Rock Blasting Emissions:

ANFO usage: 1000 lb/day
Number of days: 78 (32 -faceup, 11 -adits, 20+15 - chamber)
AP-42, Section 11.9

***Australian Department of Climate Change 2008 (CO_2 Emission Factor) Australian National Greenhouse Accounts Factors.**

Table A-14. Rock Blasting Emissions

Pollutant	Emission Factor	Units	Total Emissions, lbs
CO	67.00	lb/ton	2743.65
NOx	17.00	lb/ton	696.15
SO2	2.00	lb/ton	81.9
PM_{10}	101.00	lb/ton	4135.95
$PM_{2.5}$	11.00	lb/ton	450.45
***CO_2**	340	ton/ton ANFO	13923

ANFO (NH_4NO_3) emissions

Assumptions:

- NH_4NO_3 residue emissions are a part of the fugitive PM_{10} emissions
- 5% of the ANFO is assumed undetonated (5% of 78,000 lbs. = 3,900 lbs)
- NH_4NO_3 emissions are generated from the mixture of undetonated ANFO residue (3,900 lbs) as part of the aggregate/blasted rock (184,888,000 lbs) that is filled and dumped into a storage pile
- NH4NO3 Emissions = (ANFO residue ÷ Total Aggregate) x Total Fugitive Emissions (storage piles, filling, and dumping)
- Increased total emissions by 5% to account for feasibility study.

Table A-15. Ammonium Nitrate (NH4NO3) Emissions from the use of ANFO

Total Fugitive construction emissions (lbs):	Average	Peak
Wind erosion (storage piles)	1337.47	3110.40
Filling of blasted material	1940.40	2928.24
Dumping of blasted material	798.60	1205.16
	4076.47	**7243.80**
ANFO residue, lbs	3900	
Total Aggregate, lbs (loose aggregate + ANFO residue)	184,891,900	
Estimated ANFO (NH_4NO_3) emissions (lbs) =	**0.15**	

Table A-16. SAFER Project Emissions Summary

Activity	Total Estimated Emissions (lbs)[1]									
	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	ROG	Pb	NH_4NO_3
Rock Blasting (ANFO)	2,743.7	696.2	81.9	4,136.0	450.5	13,923.0	---	---	---	0.2
Construction Equipment (off-road and non-road)[4]	4,190.7	12,060.3	12.0	540.0	270.0	1,091,778.7	99.7	1,100.7	---	---
Construction Vehicles (off-site/on-site)	1,205.4	1,334.7	2.2	13.5	5.1	1,648,021.0	141.9	151.8	---	---
Site Clearing [4]	136.8	297.7	53.2	354.2	177.1	58.9	16.8	24.1	---	---
Fugitive (PM) Road Dust - All Vehicles	---	---	---	4,797.7	450.4	---	---	---	---	---
Fugitive (PM) Dust - Construction Operations	---	---	---	9,079.8	908.0	---	---	---	---	---
SAFER Operations - Post Construction (annual)	2,342.5	460.1	4.8	6,665.8	2,460.5	---	---	---	0.1	---
TOTAL Emissions (lbs)	**10,619.1**	**14,848.9**	**154.2**	**25,586.9**	**4,721.5**	**2,753,781.7**	**258.4**	**1,276.6**	**0.1**	**0.2**
TOTAL Emissions (Tons)	**5.3**	**7.4**	**0.1**	**12.8**	**2.4**	**1,376.9**	**0.1**	**0.6**	**0.0001**	**0.0001**
PTA Existing Annual Emissions (2009)	**46.90**	**14.00**	**25.50**	**9.08**	**---**	**---**	**---**	**11.40**	**0.01**	**---**
EPA/NJDEP Major Source Thresholds (Tons per year)	**100**	**25**	**100**	**100**	**---**	**25,000**	**---**	**25**	**---**	**---**
Significant? [2]	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

(1) N_2O is counted as NOx emissions. ROG is counted as VOC emissions.
(2) Based on SAFER Operational (annual emissions) added to existing PTA emissions statement from 2009
(3) Relative ratio of PM2.5 to PM10 is 0.37 for Operational Emissions. (Based on Nevada Test Site particulate data using 155mm rounds)
(4) Assuming PM2.5 50% of PM10 for equipment used for construction and site clearing.

Summary of AERMOD Modeling Parameters:

Model Parameters

Exit Temperature	Ambient	
Stack Inside Diameter	17.48	Ft
Exit Velocity	4.167	ft/s
Exit Flow Rate	60,000	ft^3/min

Emissions Limited to 0800 through 1600 (8-hour day)

Modeling Maximum Emissions

	(lb/hr)	(g/s)
NO_x	1.494	0.188
Pb	5.0E-04	6.251E-05
CO	9.568	1.205
SO_2	0.020	0.003
PM_{10}	27.750	3.496

Vertical Stack

	1-hour		3-hour		8-hour		24-hour		Month		Annual	
	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)
NO_x	11.44	188									0.06	100
Pb							2.15E-04	1.00E-01	3.57E-05	1.50E-01		
CO	73.24	40,000			11.98	10,000						
SO_2	0.15	200	0.05	1300								
PM_{10}							12.01	150				
$PM_{2.5}$							12.01	35				

HORIZONTAL STACK

	1-hour		3-hour		8-hour		24-hour		Month		Annual	
	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)	Modeled (µg/m³)	Standard (µg/m³)
NO_x	11.44	188									0.06	100
Pb							2.07E-04	1.00E-01	3.39E-05	1.50E-01		
CO	73.24	40000			11.98	10,000						
SO_2	0.15	200	0.05	1300								
PM_{10}							11.58	150				
$PM_{2.5}$							11.58	35				

Notes:

- Lead (Pb) standards are as follows:
  - 24-hour standard is a health risk reference concentration of 0.1 µg/m³
  - Month standard is actually a 3-month average. Data presented in monthly maximum (conservative)
- NO_x standard is actually 3-year average of 98 percentile. Data presented are 1-hour max over 5-years (conservative)
  - $PM_{2.5}$ is assumed to be equivalent to PM_{10}

Risk Screening Level-1

	LONG-TERM EFFECTS						SHORT-TERM EFFECTS			
Chemical	Q (ton/yr)	C (µg/m³)	URF [(µg/m³)⁻¹]	IR	RfC (µg/m³)	HQ	Q_h (lb/hr)	C_{st} (µg/m³)	RfC_{st} (µg/m³)	HQ_{st}
Lead	2.2E-03	4.0E-03	1.2E-05	4.8E-08			5.0E-04	2.9E-02	0.1	2.9E-01

KEY:

Long-Term Effects

Q =	Annual emission rate (in tons per year)
C =	C' x Q = Annual average ambient air concentration
URF =	Unit risk factor (for carcinogenic risk)
IR =	C x URF = Incremental risk (for carcinogen)
RfC =	Reference concentration (for noncarcinogenic effects)
HQ =	C/RfC = Hazard quotient (for noncarcinogenic risk)

Short-Term Effects

Q_h =	Hourly emission rate (in pounds per hour)
C_{st} =	C'_{st} x Q_h = Short-term average ambient air concentration
RfC_{st} =	Short-term reference concentration (for noncarcinogenic effects)
HQ_{st} =	C_{st}/RfC_{st} = Hazard quotient for short-term noncarcinogenic effects

RECORD OF NON-APPLICABILITY (RONA) FOR CLEAN AIR ACT CONFORMITY

Safe Armaments Facility for Energetics Research (SAFER)
U.S. Army Research, Development and Engineering Command
Picatinny Arsenal (Morris County), New Jersey

INTRODUCTION

The U.S. Environmental Protection Agency (USEPA) published *Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule* in the 30 November 1993, Federal Register (40 Code of Federal Regulations [CFR] Parts 6, 51, and 93). The U.S. Army Center for Health Promotion and Preventive Medicine published the *Technical Guide for Preparing a Record of Non-applicability for the Conformity Rule,* in November 2003. These publications provide implementing guidance to document CAA Conformity Determination requirements.

Federal regulations state that no department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license to permit, or approve any activity that does not conform to an applicable implementation plan. It is the responsibility of the Federal agency to determine whether a Federal action conforms to the applicable implementation plan, before the action is taken (40 CFR Part 1 51.850[a]).

The general conformity rule applies to Federal actions proposed within areas which are designated as either nonattainment or maintenance areas for a National Ambient Air Quality Standards (NAAQS) for any of the criteria pollutants. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Emissions of pollutants for which an area is in attainment are exempt from conformity analyses.

The Proposed Action would occur within Morris County, New Jersey. This county is currently in nonattainment of the 8-hour ozone (O_3) and $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5 µm or less) NAAQS. Morris County is in attainment (or simply hasn't been designated) status for NO_2, SO_2, Lead (Pb), and PM_{10}. Therefore, only project emissions of ozone and particulate matter are analyzed for conformity rule applicability. (Ozone is not a direct emission, nor are its precursors: volatile organic compounds [VOCs] and oxides of nitrogen [NO_x].) Table A-17 illustrates these requirements.

Table A-17. Air Pollutants Subject to a General Conformity Review[1]

If the installation is located in an area designated as a Nonattainment or Maintenance area for…	Then a general conformity review must be performed for…
O_3	Nitrogen oxides (NO_x) and volatile organic compounds (VOCs)
$PM_{2.5}$	$PM_{2.5}$ and $PM_{2.5}$ precursors such as acid gases or metals*

1. Tech Guide for Preparing a RONA for the Conformity Rule, USACHPPM, 2003

The annual *de minimis* levels for this region are listed in Table A-18. Federal actions may be exempt from conformity determinations if they do not exceed designated *de minimis* levels (40 CFR Part 1, Section 51.853[b]). Since Morris County is within the Ozone Transport Region, the *de minimis* values for VOCs are 50 tons and 100 tons for NO_x.

Table A-18. General Conformity Pollutant Threshold Rates (tons per year)[1]

Pollutant	Tons/Year
O_3 (Volatile Organic Compounds [VOC] or Nitrogen Oxides [NOx])	
Serious	50
Severe	25
Extreme	10
Marginal and Moderate O_3 nonattainment areas inside an O_3 transport region	
VOC	50
NOx	100
Particulate Matter	
Moderate and Maintenance Areas	100
Serious	70

[1] Source: 40 CFR 51

PROPOSED ACTION

Action Proponent: the U.S. Army Armament Research, Development and Engineering Command (ARDEC) proposes construction activities to build a Safe Armaments Facility for Energetics Research (SAFER).

Location: U.S. Army, Installation Management Command, Picatinny Arsenal, New Jersey.

Proposed Action Name: ARDEC proposes to design and construct a SAFER facility capable of confining primary/secondary fragments resulting from static detonation tests of munitions items ranging in size from 155mm High Explosive Projectiles and Warheads to 20mm HE projectiles.

Proposed Action & Emissions Summary: The Proposed Action involves a six (6) month construction project to erect a SAFER facility to prevent fragments from leaving the testing range. Operation of the test facility would produce minimal addition to Picatinny Arsenal's current emissions of air pollutants. This project is to take test activities that currently are conducted on an open range (i.e., open detonation) and place them within an enclosed structure to preclude fragments from leaving the confines of the range. Emissions of air pollutants resulting from operation of the range are identical to current values. The only net effects would occur as a result of the construction activities required to construct the tunnel and chamber structures. The construction phase of this project is envisioned to last for six months in total duration, although the six months may not be continuous to accommodate seasonal restrictions on tree-clearing and other activities.

Annual emissions from all construction activities were calculated by assuming that construction activities would occur within the six month project timeline. Estimated construction emissions due to implementation of the Proposed Action are shown in Table A-19. Based on the air quality analysis for the Proposed Action, the maximum estimated emissions would be below conformity *de minimis* levels.

Table A-19. Estimated Total Net Project Emissions – Tons per Year

Emission Source	Pollutant (tons/year)		
	VOC	NO_x	$PM_{2.5}$
Rock Blasting (ANFO)	---[1]	0.35	0.23
Construction Equipment (Diesel and Gasoline)	0.55	6.03	0.13
Construction Vehicle (on-site and off-site)	0.07	0.67	0.13
SAFER Operational Emissions (annual)	---	0.23	1.23
Total Emissions	**0.61**	**7.4**	**2.4**
de minimis threshold	50	100	50
Exceeds *de minimis* threshold?	No	No	No

[1] No emission factor data were available to quantify the specific pollutant.

Affected Air Basin: Morris County, New Jersey

Date RONA Prepared: February 1, 2011

RONA Prepared by: U.S. Army Research, Development and Engineering Command

Proposed Action Exemption:

Provisions in the General Conformity Rule (Section 51.853(c) (1)) allow for exemptions from performing a conformity determination if total emissions of individual non-attainment or maintenance area pollutants resulting from a proposed action fall below specific threshold values (*i.e.*, *de minimis* levels) or would result in no emission increase. As discussed above, the change in the levels of NO_x and VOCs caused by the proposed action to build the SAFER would involve either emissions below *de minimis* levels or result in no emissions increase. Therefore, the proposed action is exempt from requirements under the General Conformity Rule.

To the best of my knowledge, the information provided is correct and accurate and I concur in the finding that the proposed SAFER would conform to the New Jersey State Implementation Plan.

RONA APPROVAL:

Signature: ____ Date:__________

Name/Rank: ____

Appendix B. SAFER Groundwater Modeling Report (Booz Allen Hamilton, September 2011)

Groundwater Modeling Report

Submitted by Booz Allen Hamilton
in Support of the

Environmental Assessment

for the

Picatinny Arsenal
Safe Armament Facility for Energetics Research
(SAFER) Test Facility

September 2011

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PREFACE

The construction of an underground munitions test facility at Picatinny Arsenal is part of the ongoing *Safe Armament Facility for Energetics Research (SAFER)* test program at Picatinny Arsenal, New Jersey. A National Environmental Policy Act (NEPA) Environmental Assessment (EA) of the potential impact of the construction and operation of the facility is the minimum regulatory requirement associated with the advancement of the project. This includes the potential impact of construction and operational activities on groundwater beneath the site.

Continental Placer Inc. (CPI) was initially contracted for design of the facility. Their responsibilities included site selection in the Gorge Area of the Arsenal, based on preliminary surveys and a geological assessment of the preferred site, taking into account data obtained from borings into the formation (vertical and at 45-degrees) to assess its suitability for construction. Per CPI, a minimum of 35 feet of competent rock is needed above the chamber to ensure its structural integrity. Borings were obtained from a formation just southwest of the southern-most peak of the Copperas Mountain Ridge, located along the west coast of Lake Denmark.

The test facility to be constructed contains three main features: a cylindrical test chamber, 100 feet in diameter by 50 feet high; two tunnels (adits), each with cross-sectional dimensions of 16 feet x 16 feet (one reaching the top of the chamber and the other reaching the bottom of the chamber); and a portal area carved into the side of the mountain, having a vertical faceup surface where the two adits emerge from the mountain.

Groundwater was encountered during the collection of core samples (boring activities conducted in April 2010), indicating that mitigation measures to manage the water flow beneath the surface may be needed if water is encountered during construction. Groundwater flows beneath the surface not only in the rubble zones between adjacent peaks, but also in fractures and fissures, and to a minor extent in the porous layers of the formation. The presence of water-conductive porous strata (e.g., sandstone, siltstone, and sand) and fractures in the core samples further suggest that mitigation efforts may be needed to manage the flow of water in the vicinity of the SAFER.

1. ENVIRONMENTAL SETTING

Picatinny Arsenal is located in Rockaway Township, New Jersey, just north of the Wisconsin terminal moraine. Major roadways near the Arsenal include State Route 15 and Interstate 80.

The Gorge Area, an undeveloped zone at the north end of Picatinny Arsenal and location of the proposed SAFER, is positioned in a valley of approximately four acres that extends northeast to southwest. The valley is drained by Green Pond Brook. Numerous sand pits can be found on the eastern side of the gorge. As Green Pond Brook emerges from the Gorge Area, it merges with the continuation (southern portion) of Burnt Meadow Brook, which flows from the southwest tip of Lake Denmark. The northern portion of Burnt Meadow Brook feeds into the north end of Lake Denmark.

1.1 PICATINNY ARSENAL

The Arsenal has been a dedicated site for the manufacturing and testing of large and small caliber weapons, ammunition, and various explosives since the mid-1800s. In 1908, it was declared the U.S. Army's Arsenal. As a result of these activities, the groundwater resources of the Arsenal area are affected by numerous point sources of contamination (USGS, 1996). To help mitigate these issues, the U.S. Geological Survey conducted a study (USGS, 1996), along with the U.S. Army Armament Research Development and Engineering Center (ARDEC). The two objectives for this study include 1) describing the hydrogeologic framework of Picatinny Arsenal and the surrounding vicinity, and 2) constructing a valley-wide groundwater-flow model that simulated the groundwater-flow system. The results of the groundwater-flow simulation were used to evaluate potential contaminants and the results are included in the hydrology section of this document. Unfortunately, the USGS study focused on the main portion of the Arsenal, and little information was provided on the Gorge Area.

1.2 SURFACE FEATURES AND SITE TOPOGRAPHY

This proposed SAFER site is located in the New Jersey Highlands physiographic province, which ranges from 12-18 miles wide, between the Appalachian Piedmont physiographic province to the southeast and the Valley and Ridge province in the northwest. The area is made of flat-topped ridges and deep, low-lying and narrow valleys, relative to the surrounding topography. It is bordered by the steeply sloping ridges of Green Pond Mountain to the west and undifferentiated metamorphic/igneous rock to the east (Copperas Mountain). These ridges reach an average elevation of 1,000 to approximately 1,200 feet above mean sea level (MSL) within 500 feet of the valley axis. The surface water from this region flows down the steep valley walls via a number of small, unnamed, streams, ditches, and culverts to the valley axis where it contributes to the base flow of Green Pond Brook, which averages five to ten feet in width and roughly two to three feet in depth. Green Pond Brook flows to the southwest along the valley axis at a steep gradient to the confluence with Burnt Meadow Brook near the southwest tip of Lake Denmark and in the main valley of the Arsenal. The stream flows to the southwest and eventually discharges into Picatinny Lake. T the Gorge Area terrain is shown in Figure 1-1,

Figure 1-1. Gorge Area Terrain and Proposed Test Chamber Construction Location (North at Top).

Specifically, the site selected for the test chamber construction is on the Lake Denmark side of the gorge, near the highest elevations of Copperas Ridge Road, presented in the following four Google Earth images (Figures 1-2a through 1-2d). The figures show Copperas Ridge Road and the proposed portal location prominently. The length of the line representing the portal is approximately 100 feet, and the adits (tunnels) would project into the mountain, roughly perpendicular to the portal line.

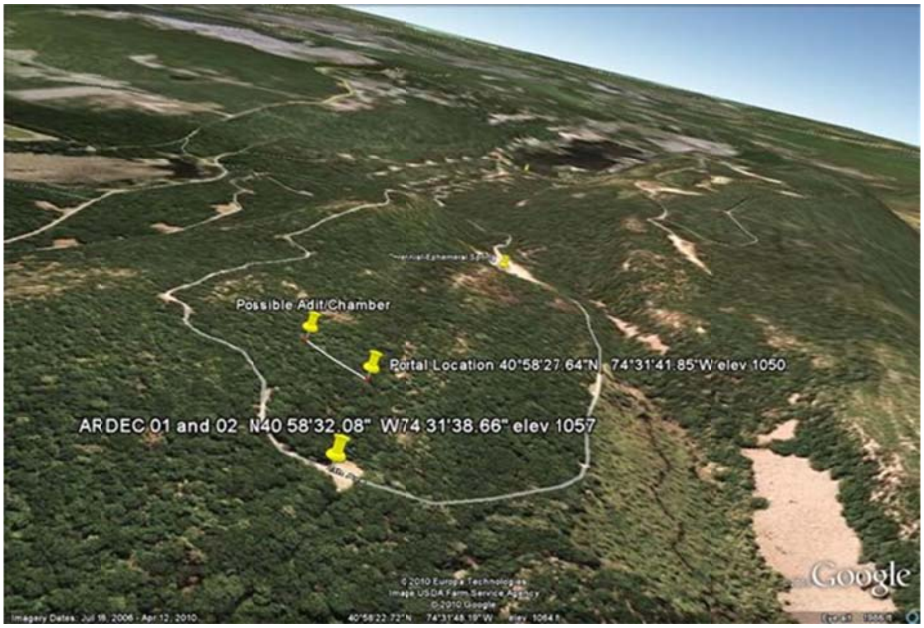


Figure 1-2a. Test Chamber Construction Location
(View from the North).

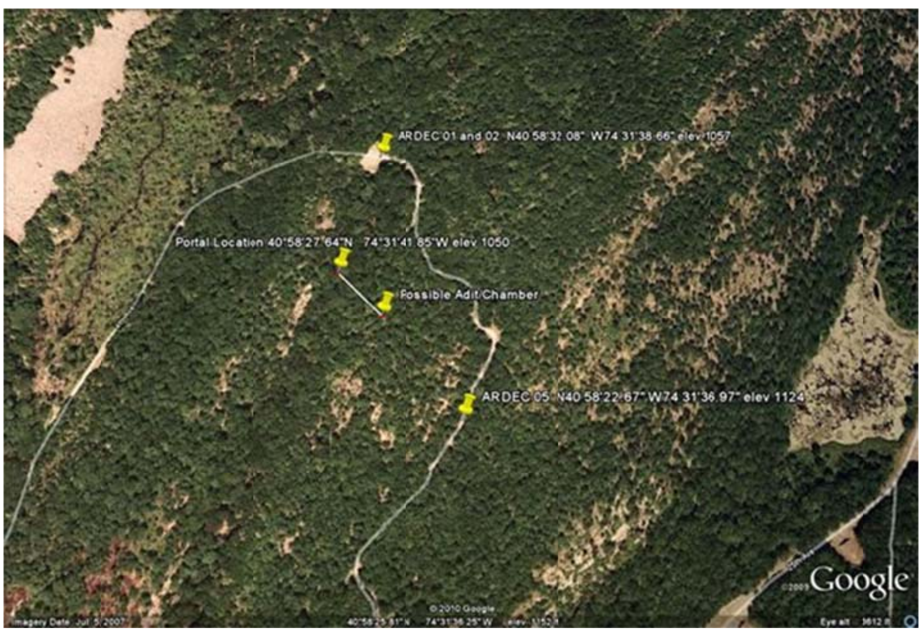


Figure 1-2b. Test Chamber Construction Location .

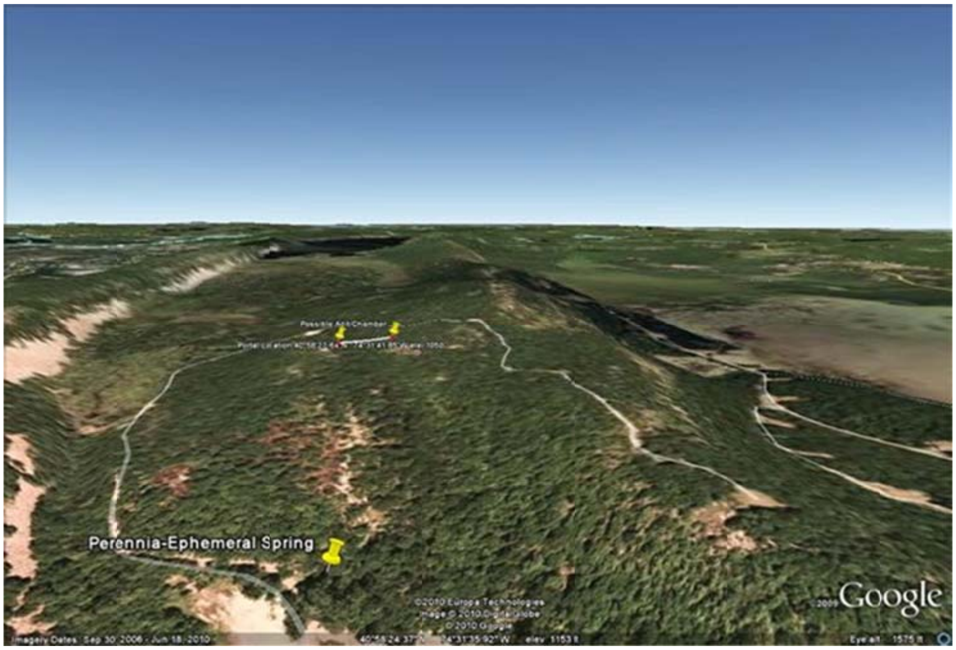


Figure 1-2c. Test Chamber Construction Location
(View from the Southwest, Showing the
Fault Line, and Spring [lower left—
approximate coordinates: 40°58’14” N, 74°31’56” W]).

Figure 1-2d. Test Chamber Construction Location
(View from the West, Showing the
Fault Line, and Spring [lower right]).

1.3 SOILS AND GEOLOGY

New Jersey soil can be categorized into two main categories: soil that is highly disturbed by human influence and soil resulting from past glacial activity. The Soil Survey of Morris County, New Jersey, identifies 27 different soil types in the Arsenal area, four of which are classified as disturbed areas as a result of human activities. The majority of these soils are mapped in the central and southwestern portion of the Arsenal where extensive filling activities have occurred in areas that were previously poorly drained. The remainder of the soils is closely related to the underlying geologic formations and past glacial influences (some contain high amounts of stone and/or gravel).

The major fault system associated with the Gorge Area is the Rockaway Valley Fault, which extends from the southwest to the northeast in Morris County. The Mount Hope Fault, located in the southwest portion of Morris County, is oriented nearly perpendicular to the Rockaway Fault. Numerous smaller faults are associated with theses major fault systems.

The soil surrounding the project site is underlain by three different mapping units:

- Ridgebury loam, 0–8% slopes (extremely stony);
- Rockaway rock outcrop, 8–15% slopes; and
- Rockaway rock outcrop 15–25% slopes.

Ridgebury soils can be hydric in depressions (RBA Group, 2009).

The geology was determined by reviewing lithologic boring logs recorded during the development of six wells in and around the Arsenal. The logs indicate that the site overburden is composed of a poorly sorted heterogeneous mixture of boulders and gravel in a silty sand matrix, with trace amounts of clay. The variable sedimentary sequence is a function of the complex geomorphic conditions, resulting from the redistribution of glacial, talus and stream related sediments. The logs also reveal that a maximum of 3-10 feet of artificial fill composed of varying amounts of sand, gravel, cobbles, boulders and rubble covers the entire site (Shaw, 2003a).

1.3.1 Regional Geology

The mineralogic rock types in and around the Arsenal include the Hardyston Quartzite and the Precambrian Gneiss. In New Jersey, the Hardyston Quartzite ranges from a quartzite to a conglomerate and varies in thinkness from a few feet to about 200 ft. The Hardyston Quartzite contains a small area of glacial deposits in the southeastern part of the Arsenal.

1.3.2 Site Geologic Features

Underneath the Arsenal are four bedrock formations that include Precambrian Basement and three lower Paleozoic sedimentary formations (Hardyston Quartzite, Leithsville Formation, and Green Pond Conglomerate). The valley fill is made-up of Pleisocene glacial deposits and small amounts of alluvium. Seventy-five percent of the basement compound consists of gneissic homblende granite and alaskite. The granites are mostly made of microperthite, quartz, hornblende and plaglocase, while the alaskite is linked to magnetite ore deposits.

Green Pond is situated in a thin northeastern-trending fault-breached syncline. The syncline is covered by lower Paleozoic sedimentary rocks, which spread over the surface of the Precambrian basement on the eastern limb of the syncline. The Green Pond Fault trends northeast up the valley on the west side of Picatinny Lake and Lake Denmark and has an estimated vertical displacement of 800 feet with a poorly constrained strike-slip displacement. The Mount Hope Fault dips about 60 degrees to the southwest, with a net slip of 300 feet (Shaw, 2003a).

1.4 LOCAL HYDROLOGY

The Arsenal is located in the central part of the New Jersey Highlands, which are a northeast-southwest-trending system made up of folded and faulted Precambrian and Devonian rocks that form a sequence of broad level highlands separated by long narrow valleys.

The seasonal variability in the precipitation, including snowfall and subsequent snow melt, is reflected in the surface water and groundwater flow rates.

1.4.1 Surface and Groundwater Hydrology

The primary source of groundwater is local precipitation (approximately 45 inches per year). However, the majority of the precipitation that falls on the mountains flows into the glacial sediments near the valley walls, and then toward Burnt Meadow Brook and Green Pond Brook. The low-permeability and the sharp slopes of Green Pond Mountain and Copperas Mountain limit the infiltration of precipitation into the mountains. Most of the precipitation that flows from the mountains is in highly porous glacial sediments and fractures (Shaw, 2003a).

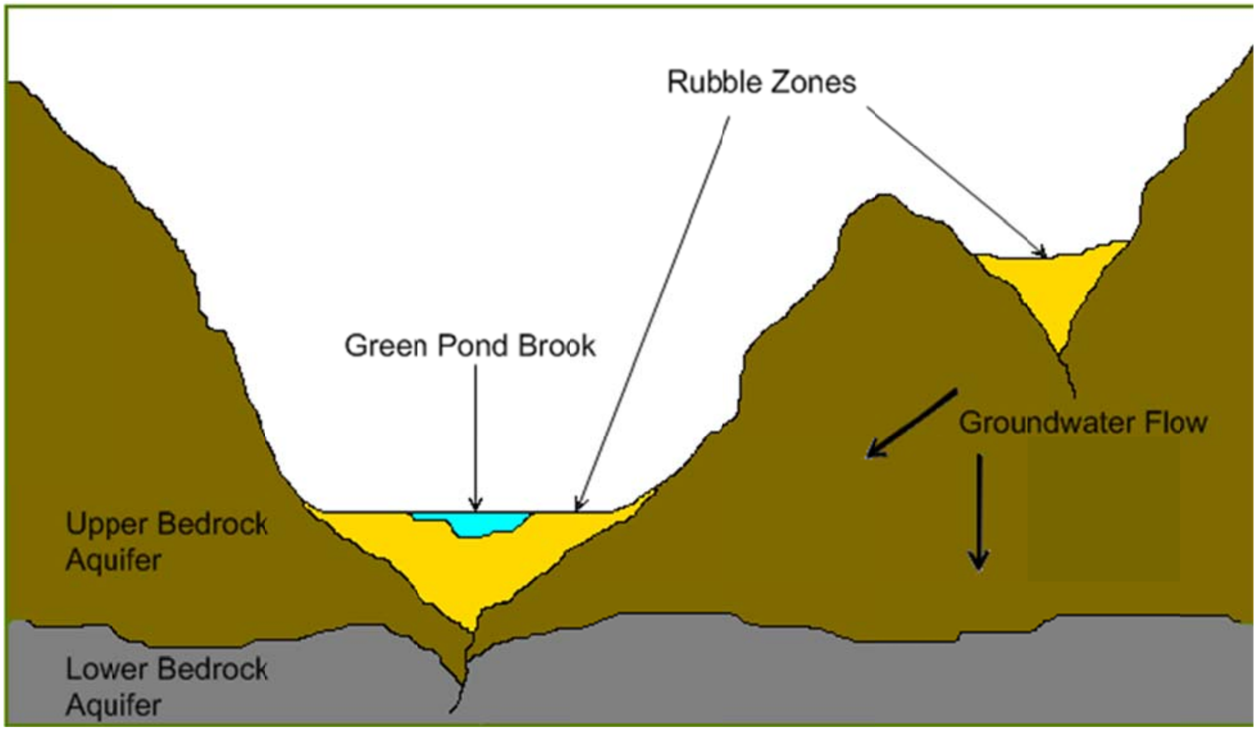


Figure 1-3. Gorge Area Aquifer Zones

During 1989-93, the U.S. Geological Survey simulated the average hydrologic condition around the Arsenal, with the help of the ARDEC.

The simulation focused on the main portion of the Arsenal and provides limited information regarding the Gorge Area in which the SAFER would be constructed.

The USGS simulation was conducted with the following boundary conditions:

- Surface runoff from the neighboring mountains was simulated as an additional recharge along the base.
- Springs from the neighboring mountains that flowed into the glacial sediments were represented as specified fluxes.
- Picatinny Lake, Rockaway River, Green Pond Brook, Bear Swamp Brook and drainage ditches were represented as head-dependent leakage boundaries.
- A head value equal to the stream or lake-surface altitude and a hydraulic-conductance term representing the hydraulic connection between the stream or lake and the aquifer were assigned to manage flow to this boundary.
- The lateral boundaries in the glacial sediments and bedrock at Picatinny Lake and southwest of the Rockaway River are no-flow boundaries.
- Groundwater that does not discharge to Green Pond Brook, Bear Swamp Brook, or the unnamed pond flows down the valley (southwest) and is assumed to release into the Rockaway River.
- The bottom of the permeable bedrock is a no-flow boundary.
- The thickness of the permeable-bedrock aquifer was assumed to be 300 ft.

Their groundwater-flow simulation was used to average the hydrologic conditions that existed during the period of 1989-1993. The simulated water levels used were similar to water levels measured during the month of January 1993 and were considered the average levels for the four year period. Water levels in 166 wells at Picatinny Arsenal were measured in January 1993.

The results of this simulation are as follows:

- Green Pond Brook gains groundwater from the underlying sediments along most of its path through Picatinny Arsenal. Roughly 6% of Green Pond contributes to groundwater inflow.
- Bear Swamp Brook gains water from and loses water to the underlying sediments in its upper reaches on the Arsenal property and then loses water to underlying sediments. Bear Swamp also contributes 14% of groundwater inflow because it is a sluggish stream.
- The Rockaway River loses water to the underlying sediments in the northeastern section and gains water from the underlying sediments in the southwestern section. Less than 3% of Rockaway contributes to groundwater inflow.
- Discharge out of Picatinny Lake constitutes nearly 15% of groundwater inflow.
- The primary sources of water to the groundwater system are recharge from precipitation and runoff from the neighboring mountains.
- A total of 87% of groundwater outflow goes into Green Pond Brook (62%) and Rockaway River (25%). Roughly 11% of groundwater outflow is released from wells and less than 2% is released to Bear Swamp Brook and an unnamed pond.

The groundwater flow through the glacial sediments and bedrock aquifer was simulated with MODFLOW, a modular three-dimensional finite-difference groundwater-flow model. The bedrock and glacial sediments were divided up into six permeable layers (representing the aquifers) and three low-permeable layers (representing the confining units). Units containing clay and silt causing obstruction of the water were found in the groundwater around the Arsenal (Rice and Voronin, 1996).

During a chemical analysis in 1999, chemical constituents found in groundwater included various amounts of the explosives HMX and RDX, but were found to be below the proposed permit amount. High levels of lead and mercury were detected and represented the only two metals found. In addition, aluminum, iron and manganese were found throughout the facility; however, these elements are linked to the weathering of the local bedrock. Lead and arsenic were identified as excessive, but fall below the RCRA Maximum Contaminant Standard. The following were also identified in the well water samples: eight anions (including perchlorates), six radiological compounds, three uranium isotopes, radium-226.

Elevated concentrations of trichloroethene (TCE) were also detected in the groundwater. This discovery led to a focused investigation in April 2004 and subsequent testing, which later confirmed the presence of TCE, RDX and MTBE in the groundwater.

1.4.2 Aquifer Characteristics

It is likely that there are two aquifers in the Arsenal gorge area: a lower bedrock situated below the gorge floor, and an upper bedrock aquifer containing rubble zones of high hydraulic conductivity.

Rubble Zone

As described in a previous report (Shaw, 2003a), six area wells are installed and connected to the rubble zone of the gorge floor. This rubble zone exhibits hydraulic conductivity and transmissivity values that range between 8.20–33.33 ft/day and 246.1–1,000 ft^2/day, respectively. These figures are typical for the types of sediments identified in the wells that connect to the aquifer.

While these characteristics should be representative of most rubble zones in the gorge area, these zones largely contribute to flow that surfaces and merges with surface water runoff that drains to Green Pond Brook.

Upper Bedrock Aquifer

Core samples from the upper bedrock aquifer in the vicinity of the SAFER construction site provided information about the characteristics of this water-bearing formation. In general, the rock in the fractured formation has low permeability, low hydraulic conductivity, and low organic carbon content. Details of the analyses performed on the core samples are discussed in the context of fate and transport modeling in Section 2.

In the vicinity of the site selected for the construction of the chamber, flow in the formation is primarily in cracks and fissures and follows surface topography (generally toward the northwest) until it reaches a fault that “short-circuits” the flow downward within the fault toward the southwest where it exits to the surface at a perennial spring (approximate coordinates: 40°58’14” N, 74°31’56” W).

Lower Bedrock Aquifer

Little is known about the lower bedrock aquifer, but for the purposes of modeling, it is assumed that the flow characteristics in the lower bedrock aquifer are similar to those of the upper bedrock aquifer, communication exists between the upper and lower bedrock aquifers, and that there are no major physical barriers between them.

1.4.3 Vadose Zone Hydrogeology

Flow in the upper bedrock and rubble zone aquifer is seasonal. While the aquifer may run full during the spring thaw, flow rates and water inventory dwindle during the course of the year as the highlands drain to a minimum inventory in the late fall. This pattern is reflected in the seasonal flow variation in Green Brook Pond.

Site-specific geological features include a fault downgradient of the site that collects area groundwater and channels it directly to a perennial spring at the low end of the fault.

1.5 CLIMATE

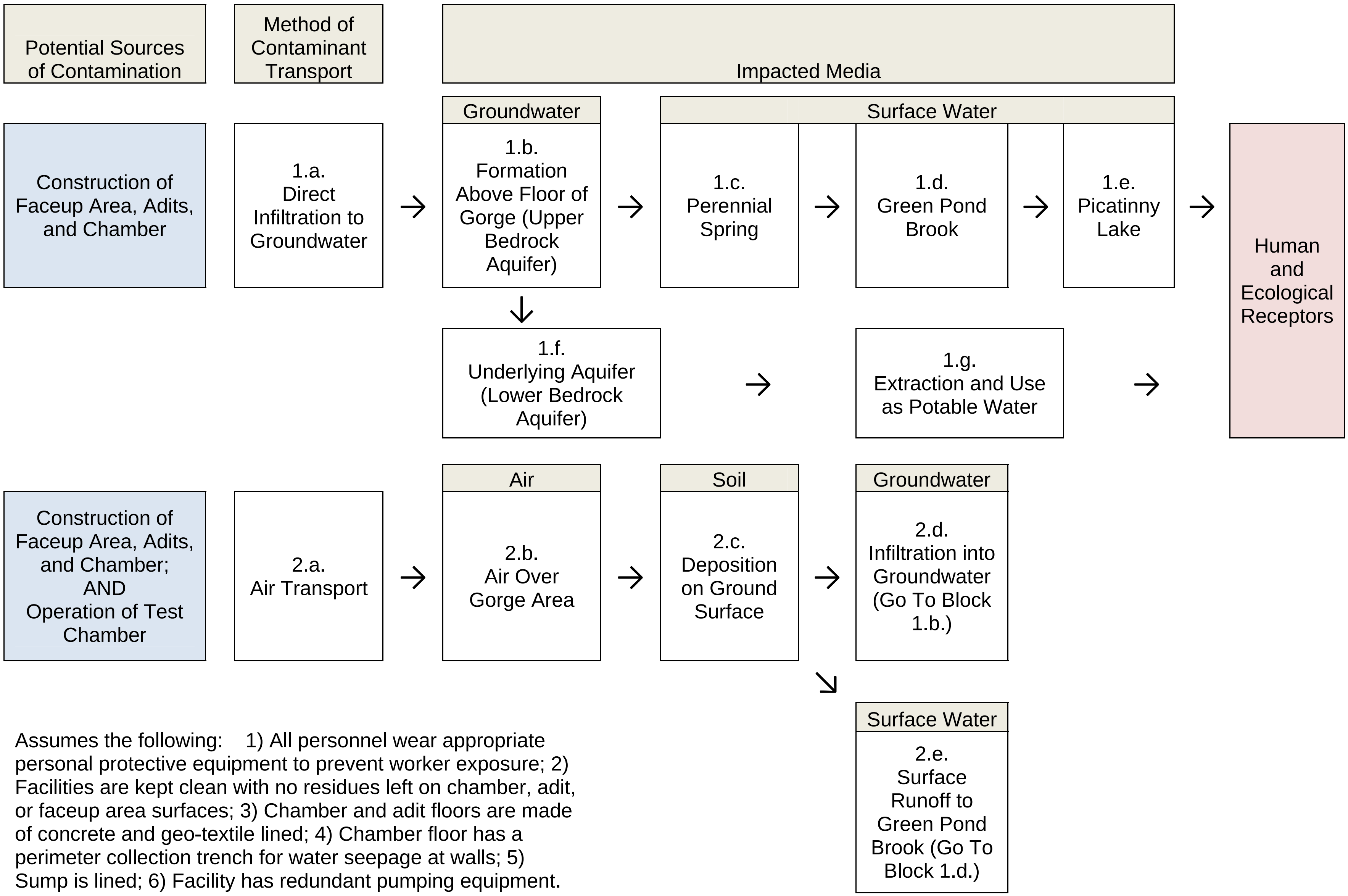
Northern New Jersey consists mainly of elevated highlands and valleys (which are part of the Appalachian Uplands) and can be characterized as having a continental temperate climate with minimal impact from the Atlantic Ocean. The predominant winds blow from the northwest during the winter and then southwest in the summer. The average monthly temperature ranges from a high of approximately 74.1 ^{o}F in July to approximately 30.7 ^{o}F in January. Annual snowfall averages 40 to 50 inches. The average number of freeze days is 163. The average annual precipitation is between 43 and 51 inches (NJSC, 2010).

1.6 POTENTIAL RECEPTORS

1.6.1 Human Receptors

The Gorge Area in which the chamber is to be constructed is relatively secluded from the rest of the installation. However, several potential human receptor exposure pathways exist, as depicted in Figure 1-4.

Green Pond Brook, which could potentially receive groundwater or surface water runoff from the vicinity of the SAFER, flows to the southwest, discharging into Picatinny Lake (see Figure 1-1, which shows the northeast tip of Picatinny Lake in the lower left portion of the figure).



Assumes the following: 1) All personnel wear appropriate personal protective equipment to prevent worker exposure; 2) Facilities are kept clean with no residues left on chamber, adit, or faceup area surfaces; 3) Chamber and adit floors are made of concrete and geo-textile lined; 4) Chamber floor has a perimeter collection trench for water seepage at walls; 5) Sump is lined; 6) Facility has redundant pumping equipment.

Figure 1-4. Exposure Pathways Involving Water.

1.6.2 Ecological Receptors

The high population of wildlife in the area includes deer, rabbit, birds, pheasants, skunk, fox, squirrels, raccoons, hawks, geese, ducks, owls, bobcats, timber rattlesnakes, fish, and bats. The open fields and plant life provide a suitable habitat for the wildlife; however, urbanization is reducing the supply and quality of the habitat. The wildlife population depends on the availability of food, shelter, and clean water. Soils in this area vary in suitability and have been rated from very poor to good, depending on the specific area tested.

Because there is communication between the groundwater in the upper bedrock aquifer and the surface water features in the area (e.g., spring at the southwest end of a fault line), species that could potentially be impacted by the contamination of groundwater include species that come in contact with Green Pond Brook and downstream water bodies, including Picatinny Lake.

While some endangered species are present in the general vicinity and some species' habitats could be disturbed (e.g., trees in which Indiana bats roost) due to construction of the test facility, these are beyond the scope of this report but will be covered in the Environmental Assessment of which this report is an appendix.

2. CONTAMINANT FATE AND TRANSPORT

2.1 PHYSICAL AND CHEMICAL PROPERTIES OF SITE-RELATED CONTAMINANTS AND SOIL MATRIX

At the onset of the groundwater modeling effort, Booz Allen requested a list of the explosives to be tested so that chemical and physical properties could be obtained for modeling purposes. These properties are needed to estimate chemical behavior that would deviate from simple advective transport. Adsorption of contaminants on solid surfaces, for example, is greatly influenced on the organic carbon content of the medium through which the groundwater flows. To accurately predict transport behavior, both the organic content (percent organic carbon) of the medium and the chemical-specific octanol/water partition coefficient are needed.

This section includes a summary of chemical-specific properties needed for modeling, as well as site-specific information regarding aquifer and groundwater characteristics that are needed for modeling, provide insight into the current conditions in the vicinity of the proposed construction site, and serve as a baseline for future studies.

2.1.1 Explosives-Related Compounds

Table 2-1 contains modeling-relevant information regarding many of the explosives to be tested at the SAFER and the ANFO that is to be used during its construction. The table was generated in anticipation of having to model all of the energetic materials to be tested at the facility; however, with the mitigation efforts that are planned for the facility (e.g., concrete floor in the test chamber), it is unlikely that any of the materials to be tested would present a groundwater contamination threat during operation of the facility. Although incomplete, the table is included primarily for reference purposes.

Table 2-1. Properties of Energetic Materials

Energetic Material					Molecular	Melting Pt.	Boiling Pt.	Water Solubility	Vapor Pressure at 20°C	Octanol/ Water Partitioning Coefficient	Henry's Law Constant, Hc	Degradation
Item No.	Acronym	Chemical Name(s)	Chemical Formula	CAS Number	Weight	(°C)	(°C)	(mg/L)[@°C]	(torr)	Log K_{ow}	(torr $L^{-1}M^{-1}$)	Byproducts
1	RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine (aka cyclotrimethylene trinitramine)	$C_3H_6N_6O_6$	121-82-4	222.126	204.1(a)	decomposes(a)	42@20(a); 7.6@25(b); 21.8-21.9@10, 38.4-38.9@20, and 66.7-67@30(c); 42.3@20, 28.9@10(d)	$4.1x10^{-9}$(a); $9.48x10^{-10}$(f)	0.86(a); 0.81-1.1(d)	$2x10^{-5}$(a); $1.1x10^{-11}$ @20[-/-](d)	MNX, DNX, TNX, 1,2-dimethylhydrazine,1,1-dimethylhydrazine, hydrazine, formaldehyde, and methanol
2	HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (aka cyclotramethylene tetranitramine)	$C_4H_8N_8O_8$	2691-41-0	296.16	276-280(a)	decomposes(a)	5.0@25(a); 2.6@20, 1.21@10(d)	$3.3x10^{-14}$(a); $8.64x19^{-16}$(f)	0.061(a); 0.06-0.26(d)	$1.1x10^{-13}$ @20[-/-](d)	Nitrate, nitrite, formaldehyde, and 1,1-dimethylhydrazine (d)
3	NTO	Nitrotriazolone (aka 3-nitro-1,2,4-triazol-5-one)	$C_2H_2N_4O_3$	932-64-9	130	270(l)		3-4% (l)	1.01E+34	-1.99(h)	$1x10^{-11.99}$(h)	
4	NQ	Nitroguanidine	$CH_4N_4O_2$	556-88-7	104.07	245(e)	decomposes@225-250(g)	4,200@25(e); 4,400@25, 82,500@100(g)	$1.43x10^{-11}$(e)	-0.83(e)		
5	CL-20 (aka HNIW)	2,4,6,8,10,12-hexanitrohexaazaisowurtzitane	$C_6H_6N_{12}O_{12}$	14913-74-7	438							
6	DNAN	2, 4- dinitroanisole	$C_7H_6N_2O_5$	119-27-7	198.13	80.1(h) (86.7)	347.67(h)			1.68 (h) (1.64)	$1x10^{-6.80}$(h) ($1x10^{-3.25}$)	
7	TNT	2,4,6-Trinitrotoluene (aka tri-nitro-toluene)	$C_7H_5N_3O_6$	118-96-7	227.13	80.1-81.6(a); 80.35(b)	explodes@240(a); 295(b)	130@20(a, b, d); 110@10(d)	$1.1x10^{-6}$(a)	1.86(a); 1.60-2.06(d)	0.18(a); $9.8x10^{-6}$ @20[-/-](d)	
8	Comp B	Composition B	60% RDX, 39% TNT, 1% Wax	n/a	224							
9	DNMT (aka MDNT)	Dinitromethyl triazole	$C_3H_3N_5O_4$									
10	DNMTO (aka MDNTO)	Dinitromethyl triazole oxide	$C_3H_3N_5O_5$									
11	Al	Aluminum	Al	7429-90-5	27	660(b)	2327(b)	insoluble (b)	0(b)			
12	TATB	triaminotrinitrobenzene; 2,4,6-trinitro-1,3,5-benzenetriamine	$C_6H_6N_6O_6$	3058-38-6	258	350(b)	Unknown (m)	insoluble (m)	$5.49x10^{-16}$(f)	-1.86(h)	$1x10^{-12.56}$(h)	
13	HTPB	Hydroxy-terminated polybutadiene (propellant)	$HO(C_4H_6)_nOH$	69102-90-5								
14	CAB (binder)	cellulose acetate butyrate (aka CABUFOCON A)	53% Butyryl-C_4H_8OO, 43% Cellulose-CH_5O_6, 2%Acetyl-$CH_3$00, 1.5% Hydroxyl-OH	9004-36-8	98.69	127-240(b)						
15	BDNP-A/F	bis(2,2-dinitropropyl)acetal/ bis(2,2-dinitropropyl)formal (plasticizer -- 50/50 mix of acetal and formal)	$[CH_3C(NO_2)_2CH_2O]_2CHCH_3$/ $[CH_3C(NO_2)_2CH_2O]_2CH_2$	5108-69-0 and 5917-61-3	664							
16a	ANFO (ammonium nitrate component)	Ammonium Nitrate (94%)/Fuel Oil (6%)	**NH_4NO_3**/$C_{17}H_{36}$	6484-52-2	80.04 (n)	170 (n)	210 (n)	1,900,000 @ 20 (o)				
16b	ANFO (fuel oil component)	Ammonium Nitrate (94%)/Fuel Oil (6%)	NH_4NO_3/**$C_{17}H_{36}$**	n/a	240							

Footnotes:

[a] EPA Clu-In Website on Characterization and Monitoring (http://www.clu-in.org/char/technologies/exp.cfm)
[b] Data provided by Picatinny Arsenal without reference.
[c] Smith-Simon and Goldhaber, 1995.
[d] Cook, 1997. (Numerous souces cited in the document)
[e] Burrows, et al., 1989.
[f] Rosen and Dickinson, 1969.
[g] ChemYQ Chemical Industry Search Engine (http://www.chemyq.com/En/xz/xz1/1854kxdxd.htm)

Per Ref. f

Comp	T(K)	A	B	Log P	P (Vap Press in Torr)
RDX	293	14.18	-31110	-9.0231194	9.48158E-10
HMX	293	16.18	-41890	-15.063287	8.64396E-16
TATB	293	14.73	-40210	-15.260274	5.49194E-16

Composition B 59% RDX: 40% TNT: 1% Wax (http://www.globalsecurity.org/military/systems/munitions/explosives-compositions.htm)
General discussion on various explosives (http://www.globalsecurity.org/military/systems/munitions/explosives-nitramines.htm)

[h] Calculated value from "Thermophysical Property Prediction of Energetic Materials from Atomistic Molecular Dynamics Simulations" by Nandhini Sokkalingam, Rebecca Lindsey and Jeffrey Potoff, presented at AIChE Meeting, 2009.
Calculated values were determined using Free Energy Perturbation (FEP) simulations at 298 K and 1.0 atmospheres. Numbers in parentheses are from cited exeperimental work.

[i] Vapor Pressure from Log_{10} p(torr) = 12.5137 + 6296.553/T_K from Minier, L. and R. Behrens (Sandia National Laboratories), "A Study of the Solid-phase Thermal Decomposition of NTO Using Simultaneous Thermogravimetric Modulatied Beam Mass Spectrometry (STMBMS)," Presented at the 33rd JANNAF Combustion Subcommittee Meeting, November 1996. The following thermal decomposition products were reported:

NH3	0.3
H20	11.8
HCN	3.0
N2 and CO	11.0
NO	25.4
HNCO	13.3
CO2 and N2O	30.1
H2NCHO	0.9
NO2 and HCO2H	0.8
C2H3N3O	1.0
C3H3N3O3	0.6
Total	98.2

2.1.2 Other Organic Compounds

Additional organic compounds that could contribute to the organic loading reaching the groundwater in and around the SAFER site originate from natural and anthropogenic sources (i.e., the construction and operation of the test facility).
As in most natural settings, surface soils contain organic compounds originating from current and previous generations of native flora and fauna. The naturally-occurring organic content of the underlying rock, however, is very low, as indicated by the analytical results in Attachment 3 from groundwater samples collected during the initial geological survey for the site.

While several organic compounds were identified in the groundwater analyses, the presence of most are not considered to be representative of the organics in groundwater and can be explained as follows:

QA Laboratories

Analyses from ARDEC 03 and ARDEC 07 boreholes were analyzed for numerous general chemistry parameters, metals, semi-volatiles, and volatiles. ARDEC 03 was closest to the selected location of the chamber. Generally, the water is of good quality.

Semi-Volatiles

- Semi-volatiles in the water are reasonable, with the highest concentrations corresponding to benzoic acid (30 mg/L), benzyl alcohol (2 mg/L), and phenol (2 mg/L), all of which are in the range that could be expected as naturally occurring in surface water.
- Diethylphthalate (6 mg/L--typically associated with plastics) and anthracene (2 mg/L—typically from combustion or road asphalt) were found.

Volatiles

- Acetone, vinyl acetate, and toluene were detected at 6, 7, and 1 mg/L. All of these compounds are typical components of insect repellents (which were used extensively during sampling).

2.1.3 Metals

- Aluminum is the primary potential metal contaminant originating from test facility operation. However, possible short-term and localized changes in the oxidation-reduction potential (ORP) and pH associated with the introduction of the fuel oil component of the explosive used in construction (ANFO) into the flowing water in the geological formation could mobilize some metals until water properties return to normal.

All metal concentrations detected in groundwater samples collected during the initial geological survey performed at the site were below Maximum Contaminant Level (MCL) and New Jersey Groundwater standards. Detected metals included the following: chromium, copper, nickel, lead, zinc, and silver. The water looks fairly clean with the highest dissolved metal concentrations corresponding to zinc, copper, nickel, chromium and beryllium at ~0.026, 0.016, 0.014, 0.004, and 0.0002 ppm, respectively. All concentrations are well below their respective Maximum Contaminant Levels (MCLs). The complete groundwater analysis results reported by QC Laboratories (two samples), along with a summary table of selected analytical results, are included in Attachment 1.

2.1.4 General Chemistry and Additional Parameters Needed for Modeling

General Chemistry

The groundwater samples exhibited general chemistry characteristics that are typical of surface water originating from precipitation and snow melt: near neutral pH; low alkalinity; low total organic carbon (TOC) [~1 ppm]; and total nitrogen, ammonia, nitrate, BOD, COD—all below detection limits. This suggests that little in the way of minerals or organic compounds are contributed to the groundwater by the surface soils and aquifer through which the groundwater flows. See Attachment 1 for the groundwater analysis results.

Hydraulic Conductivity

Hydraulic conductivity values of the bedrock sandstone were estimated from the pumping tests conducted in test holes ARDEC 10-03, 10-05, and 10-07. The estimated conductivity values ranged from 0.016 ft/day to 0.53 ft/day. The aquifer test analyses, conducted using public source spreadsheets (USGS, 2002) for the Cooper Jacobs Method, are included in Attachment 5.

Porosity and Permeability

Porosity, specific gravity, and permeability testing was performed on core samples taken during the initial site Geological Survey, and the test results are presented in Attachment 3.

Four core samples were tested (ARDEC 01 4525, ARDEC 03 4525, ARDEC 05 4525, ARDEC 07 4525). Results indicate extremely low permeability (virtually impermeable) with the following reported results for ARDEC 01, 03, 05, and 07, respectively: zero, 5.4×10^{-17} m^2, 5.1×10^{-17} m^2, and 1.9×10^{-15} m^2.

The following note was included with the test results: "Permeability of the test specimen is below the recommended limits of ASTM D 4525 test method. Unable to extrapolate data to obtain a value of Equivalent Liquid Permeability. Permeability limit of the test method is 9.9 x 10^{-13} m^2."

This indicates that the extremely low permeability values reported are beyond the normal test range. For modeling purposes, the rock was considered impermeable, and only flow through fractures was considered. The equivalent permeability was estimated from the hydraulic conductivity values discussed above.

Carbon Content

As can be seen from the following summary table of test results reported by ALS Minerals (Table 2-2), the carbon content is extremely low. The only sample with an appreciable carbon content is from the "rubble zone," and of all the samples, it is farthest from the selected location for the chamber, associated tunnels, and staging/faceup area.

Table 2-2. Summary of Carbon Content Test Results

	Received Sample Weight	Total Organic Carbon (TOC)	Inorganic Carbon (as C)	Inorganic Carbon (as CO2)	Total Carbon
	WEI-21	C-CAL05	C-GAS05	C-GAS05	C-IR07
SAMPLE	Recvd Wt.	C organic	C	CO2	C
DESCRIPTION	kg	%	%	%	%
ARDEC 01 28.5ft	0.68	<0.05	0.08	0.3	0.08
ARDEC 03 90ft	0.94	<0.05	<0.05	<0.2	0.02
ARDEC 03 120ft	0.94	<0.05	<0.05	<0.2	0.02
ARDEC 04 66ft	0.94	<0.05	<0.05	<0.2	0.03
ARDEC 07 36ft	1.22	<0.05	<0.05	<0.2	0.02

A critical parameter for the modeling is the total organic carbon (TOC). Model input parameters are discussed in Section 2.3.2.

2.2 CONCEPTUAL SITE MODEL

This section discusses the potential for releases of contaminants associated with the project and related aspects of their potential transport to groundwater and surface water in the vicinity of the site.

The Conceptual Site Model (CSM) is the basis for any fate and transport model. The following list of informational needs for the modeling effort was addressed in the formulation of the CSM:

- Contents of the source area
- Identifiable geologic strata beneath the source area
- Contaminated soil layer
- Thickness of each layer in the vadose zone
- Vertical permeability of the unsaturated soils
- Density, width, and depth of cracks which extend from the surface downward
- Water table fluctuations, and
- Receptor locations.

In addition, the potential impact of blasting was assessed. Inappropriate blasting in sensitive environments could result in changes to aquifer properties and borehole/well performance and structure. The impact of blasting is governed by the size and timing of the charges and the nature of the material being blasted. Blasting could either create new fractures or partially close existing fractures, thereby affecting the ability of water to be transmitted in the subsurface. Similarly, blasting could induce subsurface movement, resulting in rocks displacement. This could cause boreholes or wells to collapse or prevent the removal of associated pumps. Proper blast site characterization by a qualified blast expert and dewatering personnel should take into consideration the proximity of extraction and potential reinjection boreholes and wells to mitigate potential impacts in the vicinity of the blasting

2.2.1 Contaminant Sources

Potential contamination sources for the site exist for both the construction and operation phases of the project. Because the design of the test facility will include features to mitigate potential impact of materials being tested (e.g., a concrete floor in the chamber and possibly in the adits), and proper housekeeping and removal of unreacted energetic material contained in residual dust is an essential part of the safety requirements of operation for the facility, it is unlikely that a significant potential exists for groundwater contamination during the testing and maintenance phases of operation. The most significant potential for contamination is associated with the construction of the facility.

The project site construction will consist of three distinct phases—the staging/faceup area, the entrance and exhaust adits (tunnels), and test chamber—and will proceed in the order listed.

The current schedule for construction of the site includes a total of 78 days of drilling and blasting (32 days of blasting for the staging/faceup area and associated ramps, 11 days of blasting for adits, 20 days of blasting for the upper chamber and 15 days of blasting for the lower chamber). The surface area of the site is to be grubbed and cleared, as indicated on the portion of the Project Site Layout (Figure 2-1) provided by Continental Placer Inc. (CPI, November 2, 2010).

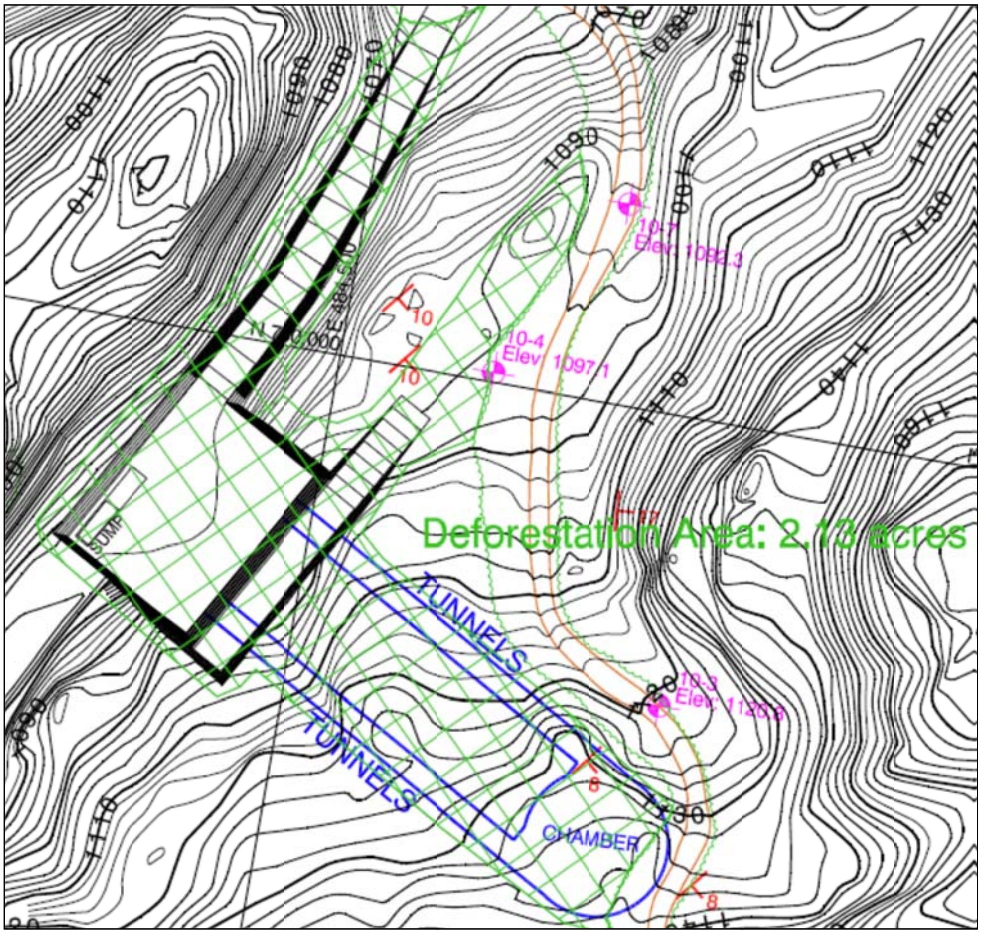


Figure 2-1. Project Site Layout. (Source: CPI, November 2, 2010)

Incremental ammonia in streams or groundwater resulting from the SAFER project would be due to equilibrium speciation of ammonium (from ANFO) with other relevant nitrogen-containing ions and ammonia. Because standards and regulations are generally set in terms of ammonia, for the purposes of this report, all ammonium is assumed to be equivalent to ammonia when comparing to regulations and standards. This is a conservative assumption. A similar conservative assumption was made in the modeling, where all ammonium was assumed to remain as the mono-valent ion. No hydrolysis, acid, or base reactions were considered, as required by the NJDEP SESOIL Guidance. This assumption maximizes the concentration of ammonium for water transport, and minimizes losses due to volatilization and reaction.

Ammonium nitrate is water soluble and dissociates into ammonium and nitrate ions in water. The characteristics of the two ions are very different, with ammonium ions showing a strong tendency to adsorb onto exposed surfaces (i.e., a large retardation factor) while nitrate ions are much less interactive with surfaces and largely flow with the water. The introduction of residual nitrates, from the blasting materials, into the ground water system is the major environmental concern. A reliable estimate is needed of the maximum potential impact of contaminants to underlying groundwater, and the time required for groundwater to return to baseline concentrations.

The impact of nitrates will coincide with the "draining" of the mountain, so that a single flush (i.e., one year) should return nitrate concentrations to normal background levels. The ammonium ions, on the other hand, will adsorb strongly, and subsequently desorb when water concentrations decrease. While the measureable increase in ammonium concentration will be spread over a broader time span, the peak concentration will be greatly reduced. Furthermore, while not considered in the modeling associated with this report, ammonia and ammonium ions are a key nutrient for many microorganisms and will readily biodegrade in their presence.

2.2.2 Hydrogeology

As mentioned previously, the Gorge Area is believed to contain two primary aquifers in the geological formation (upper bedrock and lower bedrock) with the majority of the extractable water flowing in cracks and fissures. In addition, because of the geological history of the area, there are accumulated rubble zones (see Figure 1-3) that also contain and serve as conduits for water, referred to as "overburden aquifers" in other reports. For example, the six wells described as being installed in the overburden aquifer in the Open Detonation Area (ODA) located west-southwest of the SAFER site were actually drilled in the rubble zone at the bottom of the gorge, which contains Green Pond Brook.

Blasting is not expected to cause significant changes in rock porosity and permeability below the depth over which blasting is conducted. "For blasting conducted on this project, assuming a three inch diameter drill hole, crack propagation would be limited to approximately six to twelve lateral feet outside the perimeter of the outside drill holes in the pattern. Although there would be crushing at the bottom of each vertically drilled hole, there would be little to no crack propagation below this elevation" (CPI, September 2009—see Attachment 3, *Blast-Induced Crack Propagation*).

2.2.3 Water Balance

The potential for contaminant transport begins with precipitation. The actual amount of precipitation available for flow (i.e., rain, melted snow, etc. that will reach groundwater and surface water) is highly variable and dependent upon soil type and climatic conditions. A water balance calculation can be used as a tool to quantitatively account for all the components of the hydrologic cycle at the proposed SAFER location. The components of a simple steady-state water balance model include precipitation (P), evapotranspiration (ET), surface runoff (Sr), and groundwater recharge or percolation (Gr), and their interrelationship is defined as follows:

$$P = ET + Sr + Gr$$

or

$$\text{precipitation available for flow} = Sr + Gr = P - ET\ .$$

A relatively moderate amount of runoff occurs from the site. It is expected that there will be loss of runoff water in the form of direct evaporation. The remaining water (after runoff) is infiltration, which includes loss to the atmosphere by evapotranspiration resulting from interaction with vegetation. Figures

2.2.4 Contaminant Release Mechanisms and Contaminant Transport Pathways

ANFO from the blasting and construction operations associated with the test facility will be the primary source of contaminants. The ANFO will readily dissolve in water, generating primarily ammonium and nitrate ions. ANFO typically consists of 94% ammonium nitrate and 6% fuel oil. Due to significant differences in the behavior of ammonium and nitrate, ammonium and nitrate were modeled separately. Ammonium nitrate is 23% ammonium and 77% nitrate by weight.

2.2.5 Planned and Proposed Mitigation Measures

The impact of testing activities during the operation of the SAFER facility can be reduced by implementing engineered and procedural elements in the design and standard operating procedures for the facility. Several features are included in the test facility design. Similarly, the impact of released contaminants on groundwater and surface water in the vicinity of the site can be reduced by taking steps to prevent contact of ANFO blasting residues with water (e.g., removal of all rock, rubble, and soil between stages of blasting; and installing boreholes to monitor groundwater elevation to ensure a two-foot minimum clearance between the water table and low points in the planned blasting is maintained).

The following mitigation measures/features are suggested to reduce the impact of potential contaminants during the construction and operation of the test facility. Note that recommendations made in this analysis would become “requirements” in the Finding of No Significant Impact (FNSI) or resulting ROD. The FNSI or ROD will tell the reader the requirements. The analysis provides recommendations for reducing the level of significance.

- Concrete Floors in Chamber and Adits—to minimize direct infiltration of test explosive residues and detonation byproducts into the groundwater when exposed to water.
- Concrete or Lined Water Collection Trenches and Sumps—to facilitate collection of contaminated water from wall/ceiling seepage and cleaning operations for off-site treatment (the volume of water is expected to vary seasonally).
- Good Housekeeping—to contain energetic materials within the chamber, keeping them from being spread to locations where they could be transported to groundwater, and to comply with explosion venting safety requirements for confined spaces with combustible/explosive dust (Morgan and Supine, 2008).
- Upgradient and Downgradient Monitoring Wells—to document the effectiveness of mitigation efforts, monitor fluctuations in groundwater elevations, and comply with permit reporting requirements.

A Monitoring Plan (MP) will be developed for the project and submitted to the Environmental Affairs Division for review prior to beginning construction. It is a required part of the NPDES permit, and ARDEC will develop the plan in coordination with the Garrison and construction and dewatering contractors.

If wells are found to be contaminated (i.e., approach standards/criteria), all blasting should stop temporarily until concentration(s) drop below acceptable level(s), based on model predictions and documented monitoring well response to construction activities. Mitigation measures, such as reduced daily limits on mass of ANFO used, will be adopted. Sampling frequency will be increased to verify concentration(s) is reduced as expected. If limits are exceeded, Environmental Affairs Division and NJDEP will be notified of the exceedance along with model predictions of peak concentrations that might be expected.

Groundwater modeling associated with the NEPA EA for the SAFER assumes that groundwater will be present during construction, and that dewatering will be necessary to maintain a two-foot clearance between the lowest elevation of excavation and the top of the groundwater table. Because the water table elevation varies seasonally, supplemental analysis and additional mitigation measures may be required during construction (e.g., increasing extraction rates or installing additional extraction wells). Work (construction or munitions testing) will not proceed if the water table is high. A Dewatering Plan (DP) for both construction and operation of the SAFER will be developed by the dewatering contractor.

Dewatering will be required after completion of blasting (e.g., when the groundwater table is naturally high), although minimal dewatering (i.e., maintaining the water table at an elevation less than two feet below the bottom of the excavation) for a period of time would have a positive impact on the site, in that it is required for the mobile and temporarily adsorbed contaminants to flush through. If dewatering operations were not to be maintained for the operation of the chamber, at least seasonal flooding should be expected.

2.3 CONTAMINANT TRANSPORT MODELING

2.3.1 Model Selection

Numerous models are available in the public and proprietary domains that evaluate and predict unsaturated zone flow and leaching of hazardous chemicals through soils to groundwater. Each model is unique in terms of its purpose, major hydrological, mathematical, and operational characteristics, input requirements, simulative capabilities, level of documentation, availability, and applicability. Most of the unsaturated zone models are used to predict the leaching of contaminants to groundwater for the development of soil cleanup levels at contaminated sites.

The model, SESOIL, was selected because it is appropriate for the current application and the State of New Jersey has specific guidance regarding its use. The documentation for this guidance is available at the following website: http://www.nj.gov/dep/srp/guidance/rs/igw_intro.htm. The following quote is taken from this guidance document:

When there is a "clean" or "buffer" zone between the contaminant and the water table, and where *groundwater is not impacted*, the SESOIL vadose zone model may be used to demonstrate that the soil contamination will not impact the groundwater above the applicable GWQS. This option is useful where a contaminant has low mobility, or has a higher mobility but is present at low concentrations and has a low toxicity. It is a good choice when considering chemicals with relatively low mobility that are not eligible for the "Immobile Contaminants" option or fail the SPLP test, but where a clean zone larger than two feet exists between the contamination and the water table.

The SESOIL model (GSC 1998) used for leachate modeling, when applicable, estimates pollutant concentrations in the soil profile following introduction via direct application and/or interaction with other media. The model defines the vadose zone as a column extending from the ground surface through the unsaturated zone and to the upper level of the saturated zone. Processes simulated in SESOIL are categorized in three cycles: the hydrologic cycle, sediment cycle, and pollutant cycle. Each cycle is a separate sub-module in the SESOIL code. The hydrologic cycle includes rainfall, surface runoff, infiltration, soil-water content, evapotranspiration, and groundwater recharge. The pollutant cycle includes convective transport, volatilization, adsorption/desorption, and degradation/decay. A contaminant in SESOIL can partition in up to four phases (liquid, adsorbed, air, and pure). Output of the SESOIL model includes pollutant concentrations at various depths and pollutant loss from the unsaturated zone in terms of surface runoff, percolation to groundwater, volatilization, and degradation.

The commercial software package Unsat Suite Plus (Waterloo Hydrogeologic, 2004) was used as it includes a graphical interface to apply SESOIL. Concentrations in groundwater were calculated within SESOIL using Summers Model, which is a leachate and groundwater mixing model that, when coupled with SESOIL, provides estimates of contaminant concentrations in groundwater.

The SESOIL model may be configured using different layers and even sublayers to represent intervals of the vadose zone having different hydraulic properties or where different leaching processes may apply (e.g., contaminant loading versus attenuation zones).

Although most common applications of SESOIL are to determine soil cleanup levels for organic contaminants, SESOIL has been successfully used to evaluate potential groundwater impact of inorganic chemicals and munitions residues. Figure 2-2 shows the conceptual modeling approach used.

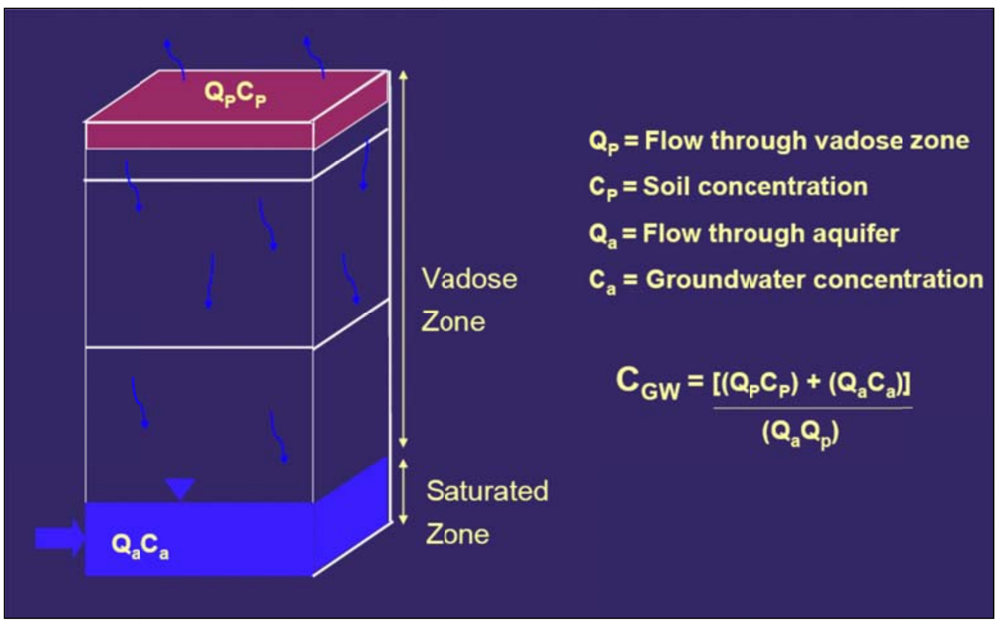


Figure 2-2. Conceptual Modeling Approach.

2.3.2 Model Input Parameters

The input parameters for SESOIL can be divided into the following four major data types: climate data, soil data, chemical data, and application data. Because of the wide seasonal variation in precipitation quantity and type and the interaction between groundwater and surface water at Picatinny Arsenal, groundwater data are also considered. Each of these five data types is covered briefly in the following discussions.

Climate Data

The climatic data required by SESOIL consists of an array of mean monthly air temperature, mean monthly cloud cover fraction, average monthly relative humidity, average monthly shortwave albedo, average daily evapotranspiration, monthly precipitation, mean number of storm events per month, mean duration of rainfall, and mean length of rainy season. All of the above mentioned climatic parameters are used for the estimation of evapotranspiration rates. The climatic data along with soil properties provide the necessary input for the execution of hydrologic cycle in SESOIL. The climate data for Newark, New Jersey, from the SESOIL database was selected.

Soil Data

The following physical characteristics of the subsurface soil describe soil data required by the SESOIL model.

Dry soil bulk density is defined as the mass of dry soil divided by the total volume (volume of solids plus volume of voids). An average for the entire soil column (i.e., for the unsaturated zone) is used in SESOIL.

Hydraulic conductivity (K) is a coefficient of proportionality describing the rate at which water can move through a porous medium. Hydraulic conductivity can range over several orders of magnitude.

Intrinsic permeability (k) is similar to K in that it pertains to the relative ease with which a porous medium can transmit a liquid. It is independent of the nature of the fluid and is related to the saturated hydraulic conductivity as follows:

$$k = K\frac{\mu}{\rho g}$$

where
k = intrinsic permeability, cm^2;
K = hydraulic conductivity, cm/sec;
μ = dynamic viscosity, g/cm-sec;
ρ = density of the fluid, g/cm^3; and
g = acceleration of gravity cm/sec^2.

Assuming water at 20 C (μ = 0.01 g/cm-sec, ρ = 0.99821 g/cm^3, and g = 980 cm/sec^2), intrinsic permeability and hydraulic conductivity are related as follows:

k (cm^2) = K (cm/sec) $\times 10^{-5}$ (cm-sec)

(i.e., intrinsic permeability [cm^2] = hydraulic conductivity [cm/sec] $\times 10^{-5}$ [cm-sec]).

Intrinsic permeability is represented in the model as a weighted estimate of the overall geological or geotechnical flow characteristics of materials encountered in the vadose zone. Permeabilities can be entered in SESOIL as a value for the entire vadose zone or as separate values corresponding to different layers. If layers are assigned different intrinsic permeabilities, SESOIL computes a depth-weighted average prior to execution of the hydrologic cycle. Since the vadoze zone soil matrix is assumed to be the same as the saturated zone, intrinsic permeability was estimated from the hydraulic conductivity of the aquifer and was entered into the model as a single value for the entire vadose zone.

Soil disconnectedness index is a parameter that relates the soil hydraulic conductivity to the moisture content. SESOIL users' guide (Hetrick and Scott, 1993b) defines this parameter to be the exponent relating the "wetting" and "drying" time-dependent conductivity of soil to its saturated conductivity. Since this parameter is related to the soil conductivity, the values of soil disconnectedness index were chosen from the NJDEP guidance values corresponding to the permeability value used. For example, for an intrinsic soil permeability value 7.0E-8 cm^2 used for the fault zone, the disconnectedness index value of 3.9 was used. For the bedrock, the baseline intrinsic permeability of 1.8E-10 cm^2 corresponded to a disconnectedness index value of 9.

Porosity describes the ratio or voids to the total volume of soil or rock. Effective porosity is the porosity associated with interconnected pore space available for transmitting fluids. Effective porosity data for input into SESOIL was obtained from other Picatinny Arsenal reports in nearby areas with similar geological characteristics and from core samples from borings obtained during the initial geological survey of the site. The core sample analyses show that although various types of rock are present, porosity of the rock at the site is very low. This indicates that almost all of the porosity in the formation is due to the fractures present. A Fact Sheet of the United States Geological Survey (USGS, 1999) states, "The effective porosity of the open fractures corresponds to the aperture or separation of the fracture and is typically much less than 1 percent of the aquifer volume. If the rate of matrix diffusion from the water flowing in the open fractures into low-permeability zones is fast enough, the apparent effective porosity of the aquifer is that of the open fractures and the immobile zones combined." A range of porosities that included 0.01 (i.e., "1 percent") were examined during modeling efforts.

The air void space calculated in the SESOIL model is represented by the difference of porosity input and soil moisture content, while the porosity of the unsaturated zone is represented by an overall estimate of the entire soil column.

Organic carbon content in the vadose zone determines the amount of contaminant adsorbed onto the soil particles during leaching. Sorption can be modeled in SESOIL by entering either a sorption coefficient (K_d) value or an organic carbon-water partitioning coefficient (K_{oc}). Sorption was modeled by using site-specific fraction of organic carbon content value and chemical-specific K_{oc} value. Sorption plays a role only for ammonium transport as ammonia (and related ions) has a high organic carbon partition coefficient. Nitrate is a highly mobile contaminant with negligible sorption; hence organic carbon has virtually no effect in nitrate transport. While the ammonium peaks in the SESOIL simulations are significantly lower than those of nitrate, the trailing end extends substantially, primarily due to adsorption. The **Freundlich exponent** (adsorption isotherm) was set to one as required by NJDEP guidance.

For the SAFER site, two separate soil types were modeled (although various types of rock are present, for modeling purposes, the rock will be referred to as “sandstone”). The design shows the faceup area being located in the “fault zone” and the adits and chamber being located within the fractured sandstone, which contains approximately one-fourth the organic carbon of the soils in the fault zone.

Cation Exchange Capacity was set to zero as required by NJDEP guidance.

Chemical Data

The pollutant fate cycle of SESOIL focuses on the various chemical transport and transformation processes that may occur in the soil zone. These processes include volatilization/diffusion, adsorption/desorption, and cation exchange, biodegradation, hydrolysis, and metal complexation. Solubility in water, air diffusion coefficient, Henry's law constant, molecular weight, the valence of the compound, and organic carbon partition coefficients are chemical-specific parameters and were obtained from literature. Biodegradation, hydrolysis, and cation exchange capacity were not used, following NJDEP guidance (NJDEP, 2008).

Application Data

The application data file of SESOIL contains the general information describing the specifics of the chemical releases or application to the unsaturated soil column. This information includes the duration of time the chemical is released to the soils, number of soil layers, sublayers into which contaminant is released, thickness of layers, the area of application. SESOIL allows the user to initialize the concentrations in the sublayers plus simulate multiple spills to the surface or load the contaminant to any first sublayer of any major layer.

SESOIL input pollutant load is defined as mass per unit area. The estimate of total ANFO to be used is provided in the construction report. Approximately 1,000 pounds of ANFO (ammonium nitrate/fuel oil explosive) will be used each day of “drilling and blasting” (CPI, November 4, 2010). Estimates of unreacted ANFO associated with mining operations have been reported to range from 0.1% to 9% by AMEC (2004) and 1% to 6% by DDMI (2006). The average of the means of these reported ranges is 4%. Based on 1,000 pounds of ANFO per day of blasting, the days of blasting projected in the construction schedule, and 4% unreacted explosives, residual mass of ANFO were estimated for all three phases. The blast dimensions were estimated from the preliminary design drawings (CPI, 2010). The residual ANFO was assumed to be distributed uniformly over all available surface areas. This includes surface area of the new structure created by the blasting and all blasted rock debris. The rock debris is assumed to be of uniform size of 2 feet by 2 feet by 2 feet. The rock debris with ANFO is assumed to be hauled away off site immediately after blasting. Following the removal of the rock debris, all the ANFO residue remaining over the floor, wall, and ceiling (for the chamber and adits) are assumed to be available for leaching to groundwater. Table 2-3 lists all parameters used to derive mass of residual ANFO remaining after blasting and hauling of the debris.

Table 2-3. Ammonium Nitrate Loading Estimated by Construction Area

Location	Days of Blasting	Total ANFO lbs	Structure Volume (ft^3)	Number of Debris (8 cubic feet each)	Surface Area of Debris (ft^2)	Structure Surface Area (ft^2)	Total Surface Area (ft^2)	4% ANFO residue (lbs)	ANFO Residue after Hauling Debris (lbs)
Faceup	32	32,000	1,125,000	140,625	3,375,000	50,000	3,427,500	1,280	19
Adits	11	11,000	200,000	25,000	600,000	31600	631,600	440	22
Chamber	35	35,000	392,500	49,062	1,177,500	31,400	1,208,900	1,400	36

The pollutant is transported into the ground by water infiltration that reaches the groundwater table. SESOIL estimates of infiltration and runoff rates are based on various parameters including the month and soil hydraulic conductivity. Figures 2-3 and 2-4 show the surface water runoff and groundwater infiltration used by the model.

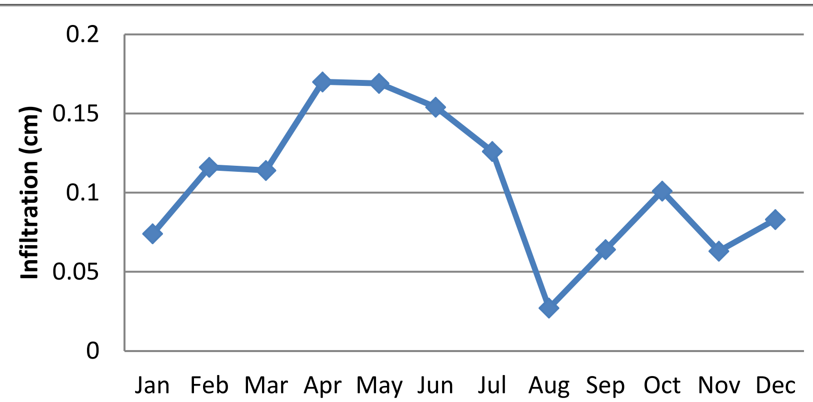


Figure 2-3. Infiltration used by SESOIL.

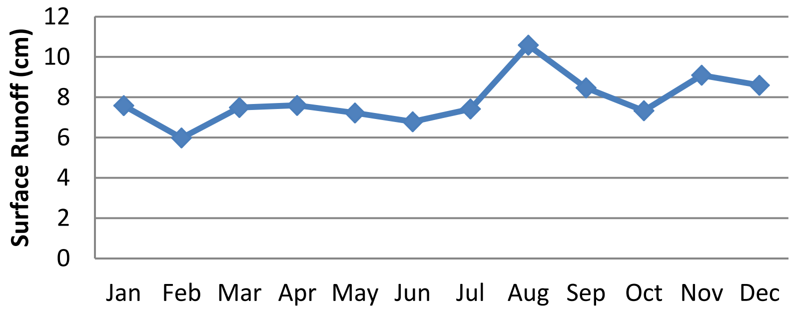


Figure 2-4. Surface water runoff used by SESOIL.

Groundwater Data

Groundwater occurs within the fault at the area where the faceup is planned, and within the sandstone bedrock where the adits and chambers will be constructed. Input parameters that describe the saturated groundwater flow are listed later in this report in Table 3-1. Groundwater mixing depth for both scenarios set at 10 feet; which is a standard default value used by many agencies in deriving soil cleanup levels that are protective of groundwater (Ohio EPA, 2008).

For sandstone bedrock, the conductivity and porosity data available from the SAFER site cores may tend to underestimate groundwater flow as the cores that were collected and tested were not likely to represent the fracture flow that occurs through the sandstone bedrock. Therefore, some hydrogeological information from a similar area, obtained from the 1200 Area (Shaw, 2003b), was used along with pump test recovery data to represent the fault zone. The hydrogeological parameters that defined groundwater flow within both zones are listed later in this report in Table 3-1.

2.3.3 Modeling Approach

The construction phase was modeled to assess possible groundwater impact from ANFO residuals remaining on surfaces following blasting operations. No contaminant should be released to the environment through the soil-to-groundwater pathway during operations of the chamber due to explosives testing, since the chamber floor will be lined with concrete and will be maintained by routinely cleaning residues and ensuring the chamber and surroundings remain dry.

The modeling effort focused on assessing the likelihood of the adverse impact of ANFO used during construction on groundwater. Ammonium and nitrate were modeled separately due to the difference in their transport characteristics. Because of the variability in the values that model parameters can assume, the assessment was performed on a range of reasonable values for the model parameters.

The initial SESOIL simulations (baseline scenarios for nitrates and ammonium for each of the three construction zones) were performed using the best estimates available for each of the required model input parameters. The remaining ANFO was assumed to leach through the floor of the structure uniformly, 77% as nitrate and 23% as ammonium. Baseline scenario simulations were followed by a sensitivity analysis that involved changing the values of model parameters (one run with values lower than those used in the corresponding baseline scenario, and another with values higher than those used in the corresponding baseline scenario). Some input parameters are related (e.g., hydraulic conductivity, intrinsic permeability, and disconnectedness index), so that related parameter values were adjusted simultaneously in the sensitivity analysis simulations. "Worst-case" scenarios were then run, using the parameter values that had yielded the highest contaminant impact during the sensitivity analysis simulations. A final set of simulations was run to assess the impact of the distance between the water table and the bottom elevations of the construction zones, using baseline and worst-case parameter values. Table 3-1 provides summaries of scenarios run, corresponding model input parameter values, and predicted contaminant concentrations for nitrate and ammonium, respectively. A thin layer of 0.1 ft thickness was used to simulate surface contamination remaining at the blast area following removal of blasted rock.

The contaminant concentrations predicted by SESOIL are in a 10-foot mixing zone below the water table. However, the groundwater in the construction area flows toward a fault that serves as a conduit discharging at a nearby spring. To assess the potential impact to the aquatic environment, additional calculations were performed using an Excel spreadsheet calculating flow rates at the fault, based on hydraulic conductivities and hydraulic gradients, and assuming a 5:1 dilution at the fault (to yield the spring concentration) and a 10:1 dilution at Green Pond Brook.

The SESOIL baseline scenarios assume a two-foot separation between the floor of the blasted surface and water level. It is assumed that the water table will be maintained at the levels modeled or lower by pumping/dewatering mechanisms in the event actual water levels are higher in the field.

Blasting impact associated with the construction of access roads was not modeled since the roads will be in the same geologic formation as the faceup, but with significantly lower potential to impact groundwater due to the smaller surface area and higher elevation.

2.3.3.1 Faceup

Figure 2-5 shows a schematic of the CSM for the modeling of the faceup area. The faceup will be entirely within the rubble zone of the "fault." After blasting and removal of blasted rock, which is estimated to require approximately 56 days (32 days of blasting on a 4 day on 3 day off weekly schedule), residual ANFO will remain on the blasted floor. Total ANFO used will be 32,000 pounds over 32 days.

Total ANFO residual remaining will be 20 pounds over the area of blast (150 feet and 100 feet). This results in a loading of approximately 0.60 grams of ammonium nitrate per square foot in the faceup area. In the modeling, 0.14 grams of ammonium and 0.47 grams of nitrate were used to simulate this loading;

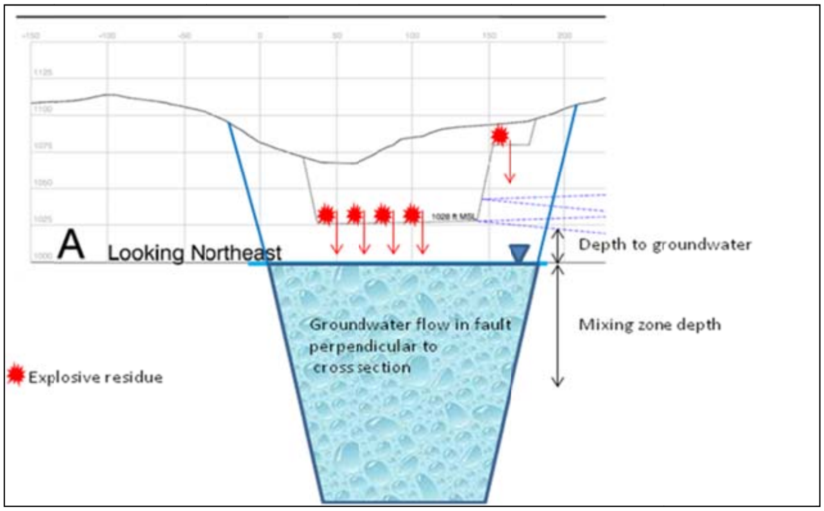


Figure 2-5. Schematic of Faceup Conceptual Site Model.

It is assumed that groundwater will be at least two feet below ground surface for all three phases, the minimum allowed to apply SESOIL by NJDEP, either naturally or through dewatering. The vadose zone was modeled as a two-foot layer, subdivided in two sublayers. As mentioned previously, ANFO residual from blasting activities was modeled to remain in the top one-tenth of a foot, and no additional fracturing is expected beneath the lowest elevation of blasting.

The hydraulic conductivity and porosity of the fault zone rubble was estimated from the 1200 Area Report (Shaw, 2003b). Figure 2-6 show the proximity of the 600 Area and the 1200 Area (OD Area) to the SAFER construction site in the Gorge Area.

The gradient along the fault zone was estimated from the surface elevation difference from ARDEC-01 to the seep downstream and the distance between the two points. Ground surface elevation is a good approximation of water surface elevation in the fault. The gradient was estimated as follows:

Difference in elevation = bottom of excavation to spring = 1088 ft - 938 ft = 150 ft.
Distance between two points = six tenths of a mile.
Gradient = 0.05.

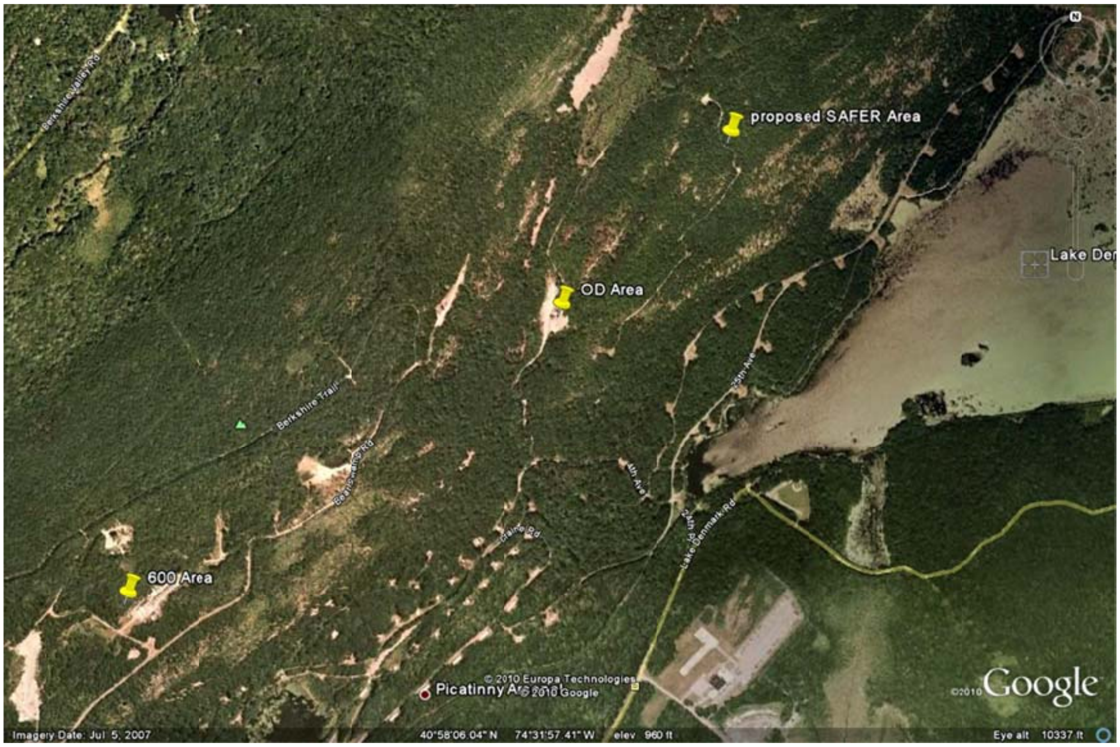


Figure 2-5. Proximity of 600 and 1200 Areas to SAFER.

2.3.3.2 Adits

The CSM for modeling explosive impact during adit construction is shown in Figure 2-7. For construction of the adits, total ANFO used 11,000 lbs over 11 days of blasting within 19 days duration. The two adits are represented in the model as one area that is 250 ft long (length of the adits) and 40 ft wide (total width of the two 20-ft wide adits) (also, although the square dimension had been reported to be 16 feet, the dimension appears to be approximately 20 ft in more recent drawings). This simplification provides conservative estimates of groundwater concentration, since the actual distance between the two tunnels that was ignored will lessen the concentration of the residuals that reach groundwater.

The adits are tunnels, therefore the explosive residue will not be on exposed surface like the faceup or chamber, rather the infiltrated water will have to travel through about 80 feet of rock before reaching the explosive residue. Ignoring the overlying rock makes this scenario yet more conservative. Time required for contaminants to reach groundwater will be delayed more than those predicted by the model as time for infiltrated water to pass through the overlying bedrock is not taken into account.

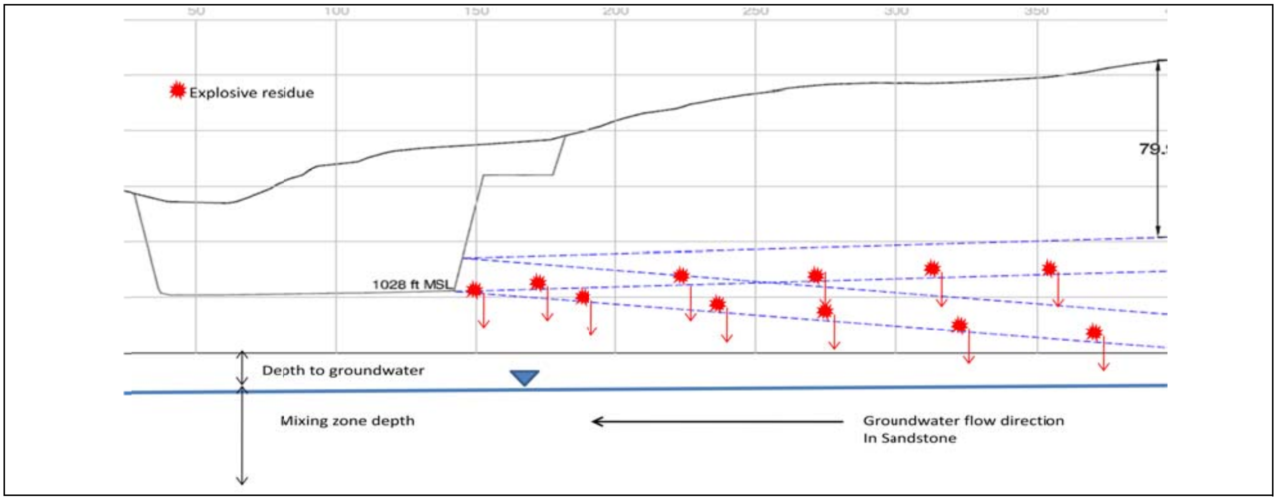


Figure 2-7. Schematic of Adit Conceptual Site Model.

Total AFFO used will be 11,000 pounds over 11 days of blasting within 19 calendar days. Total ANFO residual remaining will be 22 pounds over the area of blast (250 feet by 40 feet). This results in approximately 1 gram of ammonium nitrate per square foot in the construction of the adits. The SESOIL model distributes this mass loading uniformly over one month rather than the 11 days of blasting over a 19-day period, but the effect of this non-conservative approximation is considered small in comparison to the effects of other conservative assumptions already discussed.

For the upper bedrock, the gradient is calculated based on water levels measured during the April/May 2010 field investigation. The baseline hydraulic conductivity was estimated from the range of values obtained from the site-specific aquifer tests. A contour map is presented later in this report.

2.3.3.3 Chamber

The CSM for modeling explosive impact during the chamber construction is shown in Figure 2-8.

For construction of the chamber, total ANFO used will be 35,000 lbs over 35 days of blasting within 61 calendar days. Since SESOIL assumes the source area to be rectangular, an equivalent square having 90-ft sides is assumed as the source area. Total ANFO residual remaining will equal approximately 36 pounds over the blasted area. This results in approximately 2.1 grams of ammonium nitrate per square foot in the construction of the chamber. The chamber will also have about 80 feet of overlying bedrock, as did the adits, which is ignored by the model. This assumption implies actual concentrations reaching groundwater will be less and will take longer to reach the groundwater than model predictions.

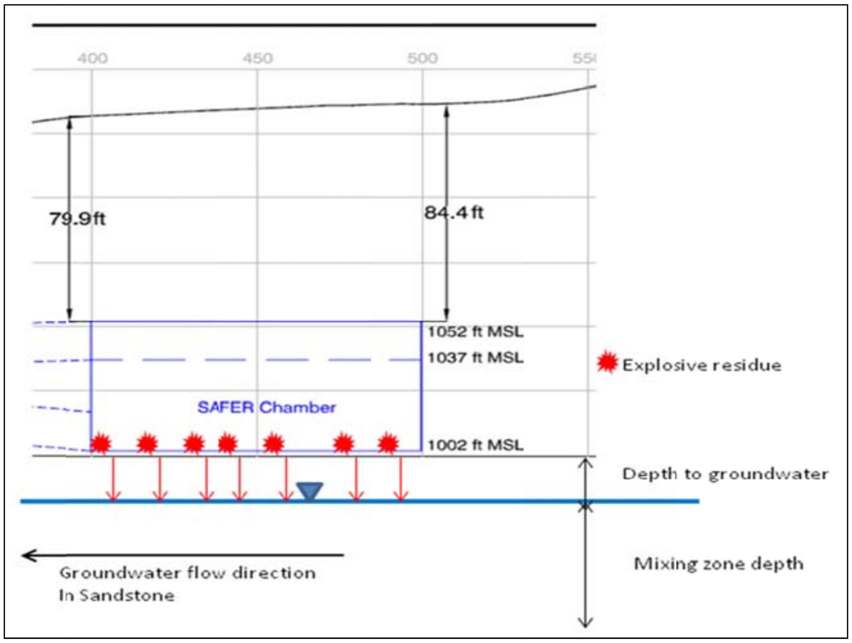


Figure 2-8. Schematic of Chamber Conceptual Site Model.

For simplicity and as a conservative approach, no further reduction of groundwater concentration due to advection and dispersion is assumed before it reaches the fault downgradient.

The mass loading calculations used to estimate SESOIL input for nitrate and ammonium for all three phases are shown in Table 2-3.

Sample SESOIL files are included in Attachment 6 for ammonium at the faceup and nitrate at the chamber. These two documents detail all geological, chemical, and climate data used in the SESOIL simulations. Electronic copies of all output files are available upon request.

3. MODELING RESULTS AND DISCUSSION

SESOIL output contains detailed mass and pollutant contaminant distributions within the various layers in various phases at monthly time intervals. The peak concentrations in groundwater predicted by the SESOIL model are the output of primary interest in the evaluation of the potential impact of construction.

The contaminant fate and transport analysis for the three construction phases was initiated under baseline conditions, based on anticipated contaminant mass loading and the input parameters discussed previously, as summarized in Table 3-1. The eight scenarios included in Table 3-1 were used to assess the sensitivity of model results in the ten-foot mixing zone beneath the construction site to changes in model parameter values. Although the results are for construction in the month of January, the purpose was to select parameter values for subsequent "worst-case" scenario analysis.

Senarios 1 through 7 represent various combinations of input parameters (permeability, organic carbon content, porosity) within the expected range of variability. Scenario 8 represents “worst case” combination of input parameters within the sensitivity analysis range. The set of input parameters in Scenario 8 was then used to simulate impact of the month of construction on by varying the initial month of mass loading from January to December (discussed in detail later in Section 3.2). Table 3-2 contains the predicted peak contaminant concentrations (worst of the worst) in groundwater for both nitrate and ammonium at the following four locations: 1) the mixing zone beneath the source areas, 2) the point where contaminated water from each of the three phases of construction reaches the fault, 3) the spring that exits the mountain at the end of the fault stream water during wet and dry seasons, and 4) the point where water from the spring-fed stream reaches Green Pond Brook during wet and dry seasons. Peak groundwater concentrations are provided as a function of the month of construction in Table 3-4, later in this section. The concentrations in both tables represent incremental loadings to be added to the contaminant concentrations that already exist at the locations cited. For the faceup phase of construction, the source is within the fault zone, so that locations 1 and 2, cited above, are one and the same; therefore, there is one less step for estimating impact of construction in the faceup area.

For comparison with national standards and guidance, the drinking water maximum contaminant level (MCL) for nitrate is 10.0 mg/L (2.2 mg N/L). The Ambient Water Quality Criteria (AWQC) for ammonia is more complex, in that it is defined by the United States Environmental Protection Agency (USEPA) as follows: “At pH=8, where freshwater mussels are present, irrespective of whether fish ELS are present or absent, the criterion ranges from 0.186 mg N/L at 30° C to 0.817 mg N/L at 0° C. When freshwater mussels are absent, the values range from 1.33 mg N/L at 30° C to 2.32 mg N/L at 0° C at times when fish ELS are present, and from 1.33 mg N/L at 30° C to 5.87 mg N/L at 0° C at times when fish ELS are absent.” (USEPA, 2009) (N=nitrogen,

Table 3-1. SESOIL Input Parameter Values and Model Results for January Construction

Contaminant Mass Loading									
Location	**Total ANFO**	**ANFO Residue**	**Contam. Zone Width**	**Area (ft^2)**	**Area (acres)**	**ANFO Loading (gm/ft^2)**	**Ammonium Loading (gm/ft^2)**	**Nitrate Loading (gm/ft^2)**	**Comment**
Faceup	32000	20	150	15000	0.34	0.60	0.14	0.47	ANFO residue from table 2-3.
Adits	11000	22	250	10000	0.23	1.00	0.23	0.77	
Chamber	35000	36	90	7850	0.18	2.08	0.48	1.61	

Parameter	Scenario*								Comment
	1	2	3	4	5	6	7	8	
Fault/Faceup Area									
Climate	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	WHI Unsuite database
Bulk Density (gm/cm^3)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	SESOIL Default/600 Area FS
Hyd. Conductivity (ft/day)	20	5	40	20	20	20	20	5	Site specific
Hyd. Conductivity (cm/sec)	7.00E-03	1.75E-03	1.40E-02	7.00E-03	7.00E-03	7.00E-03	7.00E-03	1.75E-03	
Intrinsic Permeabily (cm^2)	7.00E-08	1.80E-08	1.40E-07	7.00E-08	7.00E-08	7.00E-08	7.00E-08	1.80E-08	
Disconnectedness Index	3.9	4.0	3.7	3.9	3.9	3.9	3.9	4.0	Default for sand - SESOIL
Porosity	0.3	0.3	0.3	0.25	0.35	0.3	0.3	0.25	600 Area FS/SESOIL--sand
Organic Carbon Content (%)	0.08	0.08	0.08	0.08	0.08	0.01	0.2	0.01	Site specific (F_{oc}=0.0008)
Upper Bedrock/Adits and Chamber									
Climate	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	Dover, NJ	WHI Unsuite database
Bulk Density (gm/cm^3)	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	Site specific
Hyd. Conductivity (ft/day)	0.05	0.01	0.1	0.05	0.05	0.05	0.05	0.01	Site specific
Hyd. Conductivity (cm/sec)	1.80E-05	3.60E-06	3.60E-05	1.80E-05	1.80E-05	1.80E-05	1.80E-05	3.60E-06	
Intrinsic Permeabily (cm^2)	1.8E-10	3.50E-11	3.50E-10	1.8E-10	1.8E-10	1.8E-10	1.8E-10	3.50E-11	derived from conductivity
Disconnectedness Index	9	12	3.7	9	9	9	9	12	Estimated from permeability
Porosity	0.005	0.005	0.005	0.001	0.1	0.005	0.005	0.001	Mid-range for fractured bedrock
Organic Carbon Content (%)	0.02	0.02	0.02	0.02	0.02	0.001	0.04	0.001	Site specific (F_{oc}=0.0002)
Model Results (Maximum Contaminant Concentration in SESOIL Model Mixing Zone [mg/L]; January Construction)									
NITRATE									
Faceup	0.004	0.015	0.002	0.005	0.004	0.004	0.00	.016/0.005	Worst Case numbers -- water table at 2 and 10 feet below blasting surface.
Adits	0.34	1.21	0.17	0.34	0.07	0.34	0.34	1.80/1.10	
Chamber	1.32	5.10	0.66	1.28	0.31	1.32	1.31	7.53/4.30	
AMMONIA									
Faceup	0.0001	0.0005	0.00005	0.0001	0.0001	0.0004	0.0001	0.0006/0.0003	Disconnectedness Index is inversely related to hydraulic conductivity.
Adits	0.095	0.143	0.049	0.097	0.02	0.101	0.051	0.54/0.20	
Chamber	0.39	1.01	0.2	0.39	0.2	0.4	0.28	2.25/1.11	

*1=baseline; 2=low hydraulic conductivity/intrinsic permeability and high disconnectedness index; 3=high hydraulic conductivity/intrinsic permeability and low disconnectedness index; 4=low porosity; 5=high porosity; 6=low Foc; 7=high Foc; 8=worst case

ELS=early life stages). Although there are no MCLs for ammonia or ammonium in drinking water, the National Academy of Science recommends, and many European nations have adopted a drinking water standard for ammonia of 0.5 mg/L.

New Jersey has set nitrate criteria for aquatic life in Pinelands waters only; there are no aquatic life nitrate criteria applicable to surface waters at Picatinny Arsenal. As with USEPA AWQC, New Jersey water quality criteria for ammonia are complex. The criteria for maximum and continuous allowable concentrations for ammonia in streams relevant to Picatinny Arsenal are presented in Table 3-3 (NJDEP, December 2000).

To put these criteria into perspective, they were applied to conditions associated with Green Pond Brook. The measured surface water temperatures and pH values in the vicinity of Green Pond Brook during a survey performed in July 2010 (see Attachment 4, Table A-2) ranged from 12.6°C to 20.86°C and 4.8 to 6.65, respectively. The corresponding criteria maximum concentration and criteria continuous concentration (CMCs and CCCs, respectively) for the pH/temperature extremes possible are listed below:

T = 12.6°C, pH = 4.8: CMC = 0.94 mg NH_3-N/L, CCC = 0.89 mg NH_3-N/L,
T = 12.6°C, pH = 6.65: CMC = 0.69 mg NH_3-N/L, CCC = 0.51 mg NH_3-N/L,
T = 20.86°C, pH = 4.8: CMC = 0.90 mg NH_3-N/L, CCC = 0.83 mg NH_3-N/L, and
T = 20.86°C, pH = 6.65: CMC = 0.54 mg NH_3-N/L, CCC = 0.33 mg NH_3-N/L.

To see the corresponding results in terms of ammonia concentrations rather than ammonia nitrogen concentrations, all results would need to be multiplied by a factor of 17/14, or 1.21. For ammonium, the factor would be 18/14 or 1.29.

Analytical results from samples collected during the July 2010 field survey indicate that ammonia concentrations are well below the CMC and CCC. Projected increases in stream ammonia concentrations (assuming all ammonium is equivalent to ammonia) associated with the SAFER construction would be extremely low, and unlikely to have any significant impact on the fish population. This topic is addressed in more detail in the EA.

Specifically, the highest ammonia results measured during the July 2010 survey was 0.12 mg/L from a water sample having a temperature of 20.1°C and a pH of 5.42. The corresponding CMC and CCC are 0.83 and 0.71 mg NH_3-N/L, respectively, or in terms of ammonia, 1.00 and 0.86 mg/L, respectively

Assuming all the anticipated ammonium loading from construction (Table 3-2) were converted to ammonia and adding it to the maximum measured ammonia concentration from the July 2010 survey would still result in acceptable stream ammonia concentrations, per New Jersey water quality criteria. However, it should be noted that the results from Table 3-2 are based on several estimated stages of dilution that impact the accuracy of the projected concentrations.

Table 3-2. "Worst-Case" Peak Contaminant Concentrations at Four Mixing Locations

Location		Faceup[1]	Adits[1]	Chamber[1]
Flow[2] (cu ft/day)		250	0.4	0.9
Peak "Worst-Case" Concentrations (mg/L)				
Nitrate	In SESOIL model mixing zone[3]	0.016	1.92	8.65
	After mixing in Fault at Faceup Area[4]	0.016	0.003	0.031
	In discharge water from spring[5]	0.003	0.001	0.006
	In Green Pond Brook[6]	0.0003	0.0001	0.0006
Ammonium	In SESOIL model mixing zone[3]	0.002	0.56	2.57
	After mixing in Fault at Faceup Area[4]	0.002	0.0009	0.009
	In discharge water from spring[5]	0.0004	0.0002	0.002
	In Green Pond Brook[6]	0.00004	0.00002	0.0002

[1]Flow in Faceup Area is parallel to the fault while flows in Adits and Chamber are perpendicular to the fault. Months for the results are: Faceup (January, February, and November) , Adits (August), and Chamber (August).

[2]Based on worst-case conditions: Faceup--hydraulic conductivity of 5 ft/day, hydraulic gradient of 0.05, and cross-sectional area of 1,000 sq ft. Adits and Chamber: Based on hydraulic conductivity of 0.01 ft/day, hydraulic gradient of 0.1, and cross-sectional areas of 400 and 900 sq ft for adits and chamber, respectively.

[3]Ten-foot mixing zones beneath construction areas; SESOIL Model output.

[4]Dilution with upgradient flow entering Faceup Area, based on ratios of flows reaching the fault.

[5]Dilution with other upgradient flow entering the fault (assumed to be 5:1).

[6]Dilution with flow in Green Pond Brook (assumed to be 10:1).

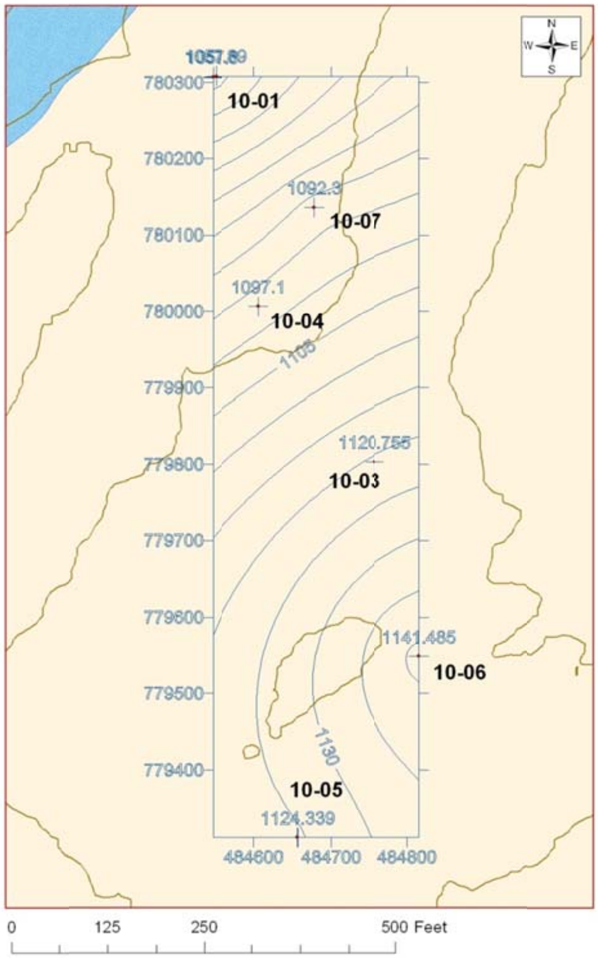
Table 3-3. NJ Water Quality Criteria for Ammonia Relevant to Green Pond Brook

Stream Classification	Criterion*	pH Conditions
FW2-TP & FW2-TM	CMC (mg NH_3-N/L) = $0.179 * 10^{0.026(\text{Temp}-20) + 0.41\,(\text{pH}-7.80)}$	pH < 8.30
	CMC (mg NH_3-N/L) = $0.179 * 10^{0.026(\text{Temp}-20) + 0.20}$	pH > 8.30
FW2-TP & FW2-TM	CCC (mg NH_3-N/L) = $0.046 * 10^{0.026(\text{Temp}-20) + 0.41\,(\text{pH}-7.80)}$	pH < 8.30
	CCC (mg NH_3-N/L) = $0.046 * 10^{0.026(\text{Temp}-20) + 0.20}$	pH > 8.30

* CMC = criteria maximum concentration, CCC = criteria continuous concentration

3.1 DILUTION AND MIXING

As stated previously, to assess the potential impact to the aquatic environment, calculations were performed to determine flow rates at the fault, based on hydraulic conductivities and hydraulic gradients, at the spring, assuming a 5:1 dilution ratio from additional water entering the fault downgradient from the project construction, and assuming a 10:1 dilution at Green Pond Brook. The hydraulic gradients in the construction area were determined from data collected in April/May 2010 during the initial geological survey (see Figure 3-1), and the hydraulic gradient in the fault was determined by the difference in elevations between the bottom of the faceup construction area and the spring at the base of the fault zone.



Numbers (e.g., 10-07) refer to initial geological survey boreholes.

Figure 3-1. SAFER Project Groundwater Elevation Contours, April 2010

Groundwater from the construction areas was assumed to reach the fault downgradient without further attenuation as a conservative approach. At the fault, contaminant concentrations within the 10-foot mixing depth were estimated using a mass balance, also known as the Summers equation.

$$C_{fault} = \frac{C_{bedrock}\, Q_{bedrock}}{(Q_{bedrock} + Q_{fault})}$$

where C_{fault} = concentration within the mixing zone of the fault
Q_{fault} = flow rate within the mixing zone of the fault
$C_{bedrock}$ = concentration within the mixing zone of the bedrock
$Q_{bedrock}$ = flow rate within the mixing zone of the bedrock

Flow rates are based on Darcy's Law, which states that the flow (*Q*) is proportional to the product of the flow area (*A*) and the hydraulic gradient (difference in water elevations per unit length that drives the flow) (*i*), with the constant of proportionality being the hydraulic conductivity of the medium (*K*).

$$Q = KiA$$

The area for the fault was based on a 100-foot width and 10-foot mixing zone depth. For bedrock, the area used was the product of the width of the contaminated zone and the 10-foot depth of the mixing zone.

Attenuation between the mixing zones of the bedrock beneath the adits and chamber and the mixing zone of the fault is assumed to be negligible, a conservative assumption.

3.2 SEASONAL IMPACT

As mentioned previously, precipitation at Picatinny Arsenal varies widely during the course of the year, with much of the precipitation that falls during the winter remaining on the ground as accumulated snow. Consequently, the time of the year during which construction activities occur will influence the probability of impacting groundwater. Conducting the blasting operations in late summer, when temperatures are high and the mountain is drained (groundwater levels naturally low), might be expected to lessen the potential transport of contaminants to groundwater or surface water. However, surface water flow would be correspondingly low, so that there would be less water available for dilution. Conversely, during the wet season (e.g., during spring melt) higher water flows are available in streams for dilution, but precipitation would enhance transport of contaminants from the construction sites and increase the likelihood of their reaching groundwater and surface water. Therefore, model results were used to assess the potential impact of construction as a function of the month performed.

Table 3-4 shows the model predictions for "worst-case" nitrate and ammonium concentrations in the mixing zones below the construction site as a function of the month during which the construction occurs. Note that these values are not the model predictions for concentrations expected for the months listed, but rather the peak concentrations (in mg/L) that would be worst-case concentrations that would be expected if the construction were to occur in the corresponding months.

Table 3-4. SESOIL "Worst-Case" Peak Concentrations by Month of Construction*

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Faceup												
Nitrate	0.016	0.0158	0.015	0.004	0.003	0.003	0.003	0.003	0.002	0.014	0.016	0.015
Ammonium	0.0006	0.0005	0.0007	0.0014	0.0011	0.0012	0.0012	0.0012	0.001	0.0013	0.0009	0.002
Adits												
Nitrate	1.8	1.7	1.67	1.49	1.51	1.55	1.62	1.92	1.83	1.72	1.82	1.75
Ammonium	0.54	0.5	0.495	0.44	0.45	0.46	0.48	0.56	0.54	0.51	0.53	0.51
Chamber												
Nitrate	5.96	6.62	6.44	5.3	5.4	5.67	6.11	8.65	6.15	6.88	7.68	7.1
Ammonium	2.25	1.98	1.92	1.58	1.61	1.69	1.84	2.57	2.32	2.06	2.3	2.11

*"Worst-case" peak concentrations (mg/L), based on model input parameters determined from the January construction simulation.

The SESOIL model is able to simulate the seasonal impact on contaminant transport through the vadose zone by taking into account the changes in precipitation, surface runoff, and air temperature. The month of the mass loading was varied to identify the months that would result in the least and most impact to groundwater. The model results showed that there are variations in the peak concentrations due to factors such as reduced volatilization in cold weather and hydrological cycles. However, there is no consistent trend since off-setting factors come into play as the seasons change, as described previously. The monthly variation runs were conducted using input parameters in Scenario 8 as the worst case. The timing and magnitude of the peak impact to groundwater is strongly dependent on soil parameters. Therefore, if combination of input parameters from a different scenario was used to evaluate the seasonal impact, the month of contaminant loading that causes the highest impact may be different. Since the soil parameters for the faceup location are different from those for the chamber and adits, the highest impact is not the same as in the other two locations. Therefore, the month of blasting that results in greatest impact may change if soil input parameters are changed.

3.3 LIMITATIONS AND ASSUMPTIONS OF THE SESOIL MODEL

Based upon the data available, a conservative approach was used, which may overestimate the contaminant concentration in the leachate for migration from estimated soil concentrations. Listed below are important assumptions used in this analysis.

- Flow and transport in the vadose zone is one-dimensional (i.e., only in the vertical direction).
- No biodegradation occurs in the vadose zone (i.e., SESOIL modeling assumes no decay)
- Initial condition is disregarded in the vadose zone modeling.
- Flow and transport are not affected by density variations.
- The minimum duration of the mass loading is one month.

- Horizontal distribution of soil contamination within a source unit is not considered.
- The aquifer is assumed homogenous and isotropic.

3.4 LIMITATIONS AND ASSUMPTIONS OF THE SITE-SPECIFIC SAFER MODEL

- Groundwater flow within the fractured bedrock is estimated as flow through an equivalent porous medium.
- Groundwater levels, naturally or through dewatering mechanisms, will be maintained at or below the baseline scenario modeled. Blasting will not cause major cracks/fissures within the formation below that will serve as direct conduits from ground surface to groundwater per CPI (Attachment 3).
- The minimum groundwater separation distance of two feet will be maintained throughout construction phase and at least a month following completion of project, or for the chamber, until the concrete floor is in place.
- The one-month minimum duration of mass loading introduced some inaccuracy to modeling results. For the faceup and chamber construction (total blasting days of 32 and 35 days, respectively), assuming that the mass is introduced in one month (30.4 days in the model) should be a reasonable and conservative approximation (slightly raise peak concentrations). The peak associated with the construction of the adits (11 days of blasting), on the other hand, should be expected to be somewhat underestimated. In all cases, the model ignores the "off days" (four-day work weeks are scheduled), which would lower the concentration peaks slightly.
- For the adit and chamber, the overlying bedrock above the blasted surface is ignored, and infiltration is assumed to directly reach the blasted surface. This assumption implies actual groundwater concentrations will be less and take longer to reach the water table than model predictions. As modeled, the maximum peak impact to groundwater is predicted within four months of initial blasting for all scenarios.
- The surface water concentrations were estimated from the model output of groundwater concentrations and mixing ratios based on field observations/estimates and best professional judgment; no site-specific measurements of surface water flow rates or groundwater discharge rates were available to derive more accurate estimates.
- Four percent of the explosives used are assumed to remain unreacted, and a proportionate mass of ANFO residue is assumed to remain on the exposed surface after the blasted rock is removed from the site.

4. SUMMARY AND CONCLUSIONS

The quality of an impact assessment is heavily dependent on the accuracy and scale of the conceptual model on which they are based. Fracture flow will dominate at the SAFER site. Conceptual models therefore need to be large enough to account for local and regional hydrologic features (recharge & discharge). Modeling can be an effective tool for predicting impacts, if they are based on reasonably accurate conceptualizations.

Groundwater impact is not highly sensitive to depth of groundwater from contaminated soil; lowering of groundwater from 2 feet to 10 feet had only a modest impact on groundwater concentration. The impact is somewhat sensitive to the month of year ANFO is released. The impact is highly sensitive to soil parameters such as permeability, porosity, and disconnectivity index. Calibration and validation of models that are used to predict future conditions are not possible. The model uncertainties were managed through conducting sensitivity analysis of the input parameters, and using "worst case" input parameters to assess groundwater and surface water impacts. Therefore, instead of trying to predict the "most likely" outcome, the model was used to predict "worst case" outcome within the expected range of variability of site conditions.

The results indicate that if the facility is constructed with conditions consistent with assumptions in the CSM, the environmental impacts to surface water will be within acceptable limits for both ammonia and nitrate. Ammonia/ammonium concentrations in the upper bedrock aquifer groundwater below the chamber are predicted to remain below applicable groundwater standards. Furthermore, based on model results and the mixing ratios used, the impact on surface water should be immeasurably small. Since no exceedance in MCLs is predicted immediately beneath the three construction zones, the lower bedrock aquifer (the regional aquifer) should not be adversely impacted either. Potential impacts can be lessened slightly by increasing the depth to groundwater through dewatering during the construction phase and other mitigation measures described in this report.

Because the results of the modeling are based on removal of most of the unreacted ANFO to a rock storage area, further study (e.g., possible groundwater modeling) and supplemental analysis (e.g., assessment of vegetative uptake of ammonium nitrate) are recommended for the rock storage area to ensure that conditions and selected mitigation measures at that location are adequate to keep from adversely impacting groundwater and nearby surface water at that site. It is yet to be determined whether it is preferable to direct precipitation that has come in contact with the stored rock to groundwater or surface water via runoff through a vegetated area. These contingencies could result in project delays and should be made clear in all contractual agreements.

5. REFERENCES

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ATTACHMENT 1

Groundwater Analysis Results

The data sheets contained in this attachment show the sample collection locations under "Sample Description." Samples were collected on May 4, 2010 from ARDEC 03 and from ARDEC 07. These locations are identified in Field Report Figure A-1 (Attachment 4). The following summary table provides selected results from those two locations.

Table A-1. Summary of Selected Groundwater Analytical Results

Parameter	Result*		Detection Limit
	ARDEC 03	ARDEC 07	
pH	7.26 [-]	6.71 [-]	N/A
Ammonia	ND [mg/L]	ND [mg/L]	0.05 [mg/L]
Nitrate	ND [mg N/L]	ND [mg N/L]	0.1 [mg N/L]
TOC	1.1 [mg/L]	1.83 [mg/L]	1.0 [mg/L]
BOD	ND [mg/L]	ND [mg/L]	2.6 [mg/L]
COD	ND [mg/L]	ND [mg/L]	10.0 [mg/L]
Alkalinity	3.47 [mg/L]	13.1 [mg/L]	2.0 [mg/L]
Total Metals	0.059474 [mg/L]	0.1231[mg/L]	N/A
VOCs	ND [µg/L]	ND [µg/L]	N/A
SVOCs	0.39 [µg/L]	0.08** [µg/L]	N/A

*ND indicates "non-detect."
This figure does not include 7.21 JN µg/L reported for diethyltoluamide (LIB SR)—a tentatively identified compound (TIC), where the identification is based on a mass spectral library search result. This compound, typically abbreviated **DEET, is the most common active ingredient in insect repellents, which was being used liberally by the field crew.

QC Laboratories

Analytical Report

NELAC ACCREDITED IN ACCORDANCE WITH
05/21/10 08:12am

Regarding:

PAUL DUSENBURY BOOZ ALLEN HAMILTON 356 NINTH AVENUE, SUITE 103 PICATINNY ARSENAL DOVER, NJ 07801	PAUL DUSENBURY BOOZ ALLEN HAMILTON 356 NINTH AVENUE, SUITE 103 PICATINNY ARSENAL DOVER, NJ 07801

Account No: W08182, BOOZ ALLEN HAMILTON P.O. No: Inv. No:
Project No: W08182, BOOZ ALLEN HAMILTON PWSID No:

Sample Number	Sample Description	Samp. Date/Time/Temp	Sampled by
L3345323-1	PICATINNY ARSENAL ARDEC-03-01 THROUGH ARDEC-03-10, 1330-1345 Received Temp: 37 F Iced (Y/N): Y	05/04/10 01:45pm NA F	Customer Sampled

Parameter	Method	NJ GRD H20	Result	RLs	Test Date
GENERAL CHEMISTRY					
SULFATE	EPA 300.0	250	7.05 mg/l	5.00 mg/l	05/06/10
NITRITE (AS N)	EPA 300.0	1	ND mg/l	0.200 mg/l	05/06/10
AMMONIA NITROGEN AS N LOW LEVE	SM 4500NH3 D		ND mg/l	0.0500 mg/l	05/10/10
ALKALINITY	SM 2320B		5.17 mg/l	2.00 mg/l	05/07/10
PH LAB	SM 4500H+B	6.5-8.5	7.26 units	0.0100 units	05/07/10
PERCHLORATE	EPA 314.0		ND ug/l	5.00 ug/l	05/17/10
ALKALINITY	SM 2320B		3.47 mg/l	2.00 mg/l	05/06/10
BIOCHEMICAL OXYGEN DEMAND	SM 5210B		ND mg/l	2.60 mg/l	05/06/10
CHEMICAL OXYGEN DEMAND	HACH 8000		ND mg/l	10.0 mg/l	05/07/10
TOTAL NITROGEN	LAB CALC		ND mg/l	1.00 mg/l	05/19/10
NITRATE AS N LOW LEVEL	SM 4500NO3 F		ND mg/l	0.100 mg/l	05/11/10
TOTAL ORGANIC CARBON	SM 5310C		1.11 mg/l	1.00 mg/l	05/08/10
METALS					
SILVER	EPA 200.7	0.04	ND mg/l	0.00100 mg/l*	05/14/10
ARSENIC	EPA 200.7	0.003	ND mg/l	0.00720 mg/l*	05/14/10
BERYLLIUM	EPA 200.7	0.001	0.000174 B mg/l	0.000130 mg/l*	05/14/10
CADMIUM	EPA 200.7	0.004	ND mg/l	0.000183 mg/l*	05/14/10
CHROMIUM	EPA 200.7	0.07	0.00400 B mg/l	0.000305 mg/l*	05/14/10
COPPER	EPA 200.7	1.3	0.0167 mg/l	0.00110 mg/l*	05/14/10
NICKEL	EPA 200.7	0.1	0.0140 mg/l	0.000452 mg/l*	05/14/10
LEAD	EPA 200.7	0.005	ND mg/l	0.00240 mg/l*	05/14/10
ANTIMONY	EPA 200.7	0.006	ND mg/l	0.00440 mg/l*	05/14/10
SELENIUM	EPA 200.7	0.04	ND mg/l	0.00870 mg/l*	05/14/10
THALLIUM	EPA 200.7	0.002	ND mg/l	0.00970 mg/l*	05/14/10
ZINC	EPA 200.7	2	0.0258 mg/l	0.000397 mg/l*	05/14/10
SILVER DISSOLVED	EPA 200.7		ND mg/l	0.00100 mg/l*	05/14/10
ARSENIC DISSOLVED	EPA 200.7		ND mg/l	0.00720 mg/l*	05/14/10
BERYLLIUM DISSOLVED	EPA 200.7		0.000182 B mg/l	0.000130 mg/l*	05/14/10

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Account No: W08182, BOOZ ALLEN HAMILTON P.O. No: Inv. No:
Project No: W08182, BOOZ ALLEN HAMILTON PWSID No:

Sample Number: L3345323-1
Sample Description: PICATINNY ARSENAL ARDEC-03-01 THROUGH ARDEC-03-10, 1330-1345
Samp. Date/Time/Temp: 05/04/10 01:45pm NA F
Sampled by: Customer Sampled

Parameter	Method	NJ GRD H20	Result	RLs	Test Date
CADMIUM DISSOLVED	EPA 200.7		ND mg/l	0.000183 mg/l*	05/14/10
CHROMIUM DISSOLVED	EPA 200.7		0.00110 B mg/l	0.000305 mg/l*	05/14/10
COPPER DISSOLVED	EPA 200.7		0.0178 mg/l	0.00110 mg/l*	05/14/10
NICKEL DISSOLVED	EPA 200.7		0.0146 mg/l	0.000452 mg/l*	05/14/10
LEAD DISSOLVED	EPA 200.7		ND mg/l	0.00240 mg/l*	05/14/10
ANTIMONY DISSOLVED	EPA 200.7		ND mg/l	0.00440 mg/l*	05/14/10
SELENIUM DISSOLVED	EPA 200.7		ND mg/l	0.00870 mg/l*	05/14/10
THALLIUM DISSOLVED	EPA 200.7		ND mg/l	0.00970 mg/l*	05/14/10
ZINC DISSOLVED	EPA 200.7		0.0255 mg/l	0.000397 mg/l*	05/14/10
MERCURY	EPA 245.1	0.002	ND mg/l	0.0000350 mg/l*	05/12/10
MERCURY DISSOLVED	EPA 245.1		ND mg/l	0.0000350 mg/l*	05/12/10
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES					
BIS(2-CHLOROETHYL)ETHER	EPA 8270C		ND ug/l	0.730 ug/l*	05/11/10
ANILINE	EPA 8270C	6	ND ug/l	0.980 ug/l*	05/11/10
PHENOL	EPA 8270C	2000	ND ug/l	0.390 ug/l*	05/11/10
2-CHLOROPHENOL	EPA 8270C	40	ND ug/l	0.660 ug/l*	05/11/10
1,3-DICHLOROBENZENE	EPA 8270C	600	ND ug/l	1.02 ug/l*	05/11/10
1,4-DICHLOROBENZENE	EPA 8270C	75	ND ug/l	1.09 ug/l*	05/11/10
1,2-DICHLOROBENZENE	EPA 8270C	600	ND ug/l	1.06 ug/l*	05/11/10
BENZYL ALCOHOL	EPA 8270C	2000	ND ug/l	0.630 ug/l*	05/11/10
BIS(2-CHLOROISOPROPYL)ETHER	EPA 8270C	300	ND ug/l	0.760 ug/l*	05/11/10
2-METHYLPHENOL	EPA 8270C		ND ug/l	0.530 ug/l*	05/11/10
HEXACHLOROETHANE	EPA 8270C	7	ND ug/l	1.14 ug/l*	05/11/10
N-NITROSO-DI-N-PROPYLAMINE	EPA 8270C	10	ND ug/l	0.670 ug/l*	05/11/10
3&4-METHYLPHENOL	EPA 8270C		ND ug/l	0.780 ug/l*	05/11/10
NITROBENZENE	EPA 8270C	6	ND ug/l	0.580 ug/l*	05/11/10
ISOPHORONE	EPA 8270C	40	ND ug/l	0.510 ug/l*	05/11/10
2-NITROPHENOL	EPA 8270C		ND ug/l	0.550 ug/l*	05/11/10
2,4-DIMETHYLPHENOL	EPA 8270C	100	ND ug/l	1.16 ug/l*	05/11/10
BIS(2-CHLOROETHOXY)METHANE	EPA 8270C		ND ug/l	0.630 ug/l*	05/11/10
2,4-DICHLOROPHENOL	EPA 8270C	20	ND ug/l	0.570 ug/l*	05/11/10
BENZOIC ACID	EPA 8270C	30000	ND ug/l	22.4 ug/l*	05/11/10
1,2,4-TRICHLOROBENZENE	EPA 8270C	9	ND ug/l	1.05 ug/l*	05/11/10
4-CHLOROANILINE	EPA 8270C	30	ND ug/l	1.03 ug/l*	05/11/10
4-CHLORO-3-METHYLPHENOL	EPA 8270C		ND ug/l	0.490 ug/l*	05/11/10
HEXACHLOROCYCLOPENTADIENE	EPA 8270C	40	ND ug/l	1.32 ug/l*	05/11/10
2,4,6-TRICHLOROPHENOL	EPA 8270C	20	ND ug/l	0.540 ug/l*	05/11/10
2,4,5-TRICHLOROPHENOL	EPA 8270C	700	ND ug/l	0.480 ug/l*	05/11/10
2-CHLORONAPHTHALENE	EPA 8270C	600	ND ug/l	1.07 ug/l*	05/11/10
2-NITROANILINE	EPA 8270C		ND ug/l	0.680 ug/l*	05/11/10
DIMETHYLPHTHALATE	EPA 8270C		ND ug/l	0.690 ug/l*	05/11/10
2,6-DINITROTOLUENE	EPA 8270C	10	ND ug/l	0.560 ug/l*	05/11/10

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Sample Number	Sample Description	Samp. Date/Time/Temp	Sampled by
L3345323-1	PICATINNY ARSENAL ARDEC-03-01 THROUGH ARDEC-03-10, 1330-1345	05/04/10 01:45pm NA F	Customer Sampled

Parameter	Method	NJ GRD H20	Result	RLs	Test Date
3-NITROANILINE	EPA 8270C		ND ug/l	0.560 ug/l*	05/11/10
2,4-DINITROPHENOL	EPA 8270C	40	ND ug/l	1.57 ug/l*	05/11/10
DIBENZOFURAN	EPA 8270C		ND ug/l	0.670 ug/l*	05/11/10
2,4-DINITROTOLUENE	EPA 8270C	10	ND ug/l	0.500 ug/l*	05/11/10
4-NITROPHENOL	EPA 8270C		ND ug/l	1.11 ug/l*	05/11/10
4-CHLOROPHENYL-PHENYLETHER	EPA 8270C		ND ug/l	0.830 ug/l*	05/11/10
DIETHYLPHTHALATE	EPA 8270C	6000	ND ug/l	0.770 ug/l*	05/11/10
4-NITROANILINE	EPA 8270C		ND ug/l	0.940 ug/l*	05/11/10
4,6-DINITRO-2-METHYLPHENOL	EPA 8270C		ND ug/l	0.480 ug/l*	05/11/10
N-NITROSODIPHENYLAMINE	EPA 8270C	200	ND ug/l	0.680 ug/l*	05/11/10
1,2-DIPHENYLHYDRAZINE	EPA 8270C	20	ND ug/l	0.540 ug/l*	05/11/10
4-BROMOPHENYL-PHENYLETHER	EPA 8270C		ND ug/l	0.740 ug/l*	05/11/10
CARBAZOLE	EPA 8270C		ND ug/l	0.760 ug/l*	05/11/10
DI-N-BUTYLPHTHALATE	EPA 8270C	700	ND ug/l	0.840 ug/l*	05/11/10
BENZIDINE	EPA 8270C	20	ND ug/l	14.3 ug/l*	05/11/10
BUTYLBENZYLPHTHALATE	EPA 8270C	100	ND ug/l	0.710 ug/l*	05/11/10
3,3'-DICHLOROBENZIDINE	EPA 8270C	30	ND ug/l	0.350 ug/l*	05/11/10
BIS(2-ETHYLHEXYL)PHTHALATE	EPA 8270C		ND ug/l	0.780 ug/l*	05/11/10
DI-N-OCTYLPHTHALATE	EPA 8270C	100	ND ug/l	0.920 ug/l*	05/11/10
NONE FOUND	EPA 8270C LIB SR		ND		05/11/10
N-NITROSODIMETHYLAMINE	EPA 8270C	0.8	ND ug/l	0.01 ug/l*	05/14/10
NAPHTHALENE	EPA 8270C	300	ND ug/l	0.02 ug/l*	05/14/10
HEXACHLOROBUTADIENE	EPA 8270C	1	ND ug/l	0.02 ug/l*	05/14/10
2-METHYLNAPHTHALENE	EPA 8270C		0.02 ug/l	0.02 ug/l*	05/14/10
ACENAPHTHYLENE	EPA 8270C		ND ug/l	0.02 ug/l*	05/14/10
ACENAPHTHENE	EPA 8270C	400	ND ug/l	0.02 ug/l*	05/14/10
FLUORENE	EPA 8270C	300	ND ug/l	0.02 ug/l*	05/14/10
HEXACHLOROBENZENE	EPA 8270C	0.02	ND ug/l	0.02 ug/l*	05/14/10
PENTACHLOROPHENOL	EPA 8270C	0.3	ND ug/l	0.02 ug/l*	05/14/10
PHENANTHRENE	EPA 8270C		0.03 ug/l	0.03 ug/l*	05/14/10
ANTHRACENE	EPA 8270C	2000	0.02 B ug/l	0.01 ug/l*	05/14/10
FLUORANTHENE	EPA 8270C	300	0.03 B ug/l	0.02 ug/l*	05/14/10
PYRENE	EPA 8270C	200	0.03 ug/l	0.03 ug/l*	05/14/10
BENZO(A)ANTHRACENE	EPA 8270C	0.1	0.03 B ug/l	0.02 ug/l*	05/14/10
CHRYSENE	EPA 8270C	5	0.03 ug/l	0.03 ug/l*	05/14/10
BENZO(B)FLUORANTHENE	EPA 8270C	0.2	0.04 B ug/l	0.03 ug/l*	05/14/10
BENZO(K)FLUORANTHENE	EPA 8270C	0.5	0.03 B ug/l	0.02 ug/l*	05/14/10
BENZO(A)PYRENE	EPA 8270C	0.1	0.03 B ug/l	0.01 ug/l*	05/14/10
INDENO(1,2,3-CD)PYRENE	EPA 8270C	0.2	0.03 ug/l	0.03 ug/l*	05/14/10
DIBENZ(A,H)ANTHRACENE	EPA 8270C	0.3	0.04 ug/l	0.03 ug/l*	05/14/10
BENZO(G,H,I)PERYLENE	EPA 8270C		0.03 B ug/l	0.02 ug/l*	05/14/10
GAS CHROMATOGRAPHY MASS SPECTROMETRY; VOLATILES					
CHLOROMETHANE	EPA 8260B		ND ug/l	0.320 ug/l*	05/07/10

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Thomas J. Hines, President

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Account No: W08182, BOOZ ALLEN HAMILTON   P.O. No: Inv. No:
Project No: W08182, BOOZ ALLEN HAMILTON   PWSID No:

Sample Number	Sample Description	Samp. Date/Time/Temp	Sampled by
L3345323-1	PICATINNY ARSENAL ARDEC-03-01 THROUGH ARDEC-03-10, 1330-1345	05/04/10 01:45pm NA F	Customer Sampled

Parameter	Method	NJ GRD H20	Result	RLs	Test Date
VINYL CHLORIDE	EPA 8260B	1	ND ug/l	0.240 ug/l*	05/07/10
BROMOMETHANE	EPA 8260B	10	ND ug/l	0.480 ug/l*	05/07/10
CHLOROETHANE	EPA 8260B		ND ug/l	0.310 ug/l*	05/07/10
ACROLEIN	EPA 8260B	5	ND ug/l	2.61 ug/l*	05/07/10
ACRYLONITRILE	EPA 8260B	2	ND ug/l	1.15 ug/l*	05/07/10
1,1-DICHLOROETHENE	EPA 8260B		ND ug/l	0.310 ug/l*	05/07/10
ACETONE	EPA 8260B	6000	ND ug/l	3.26 ug/l*	05/07/10
CARBON DISULFIDE	EPA 8260B	700	ND ug/l	0.640 ug/l*	05/07/10
METHYLENE CHLORIDE	EPA 8260B	3	ND ug/l	0.500 ug/l	05/07/10
TRANS-1,2-DICHLOROETHENE	EPA 8260B	100	ND ug/l	0.180 ug/l*	05/07/10
1,1-DICHLOROETHANE	EPA 8260B	50	ND ug/l	0.240 ug/l*	05/07/10
VINYL ACETATE	EPA 8260B	7000	ND ug/l	0.610 ug/l*	05/07/10
2-BUTANONE	EPA 8260B	300	ND ug/l	0.590 ug/l*	05/07/10
CIS-1,2-DICHLOROETHENE	EPA 8260B	70	ND ug/l	0.280 ug/l*	05/07/10
CHLOROFORM	EPA 8260B	70	ND ug/l	0.230 ug/l*	05/07/10
1,1,1-TRICHLOROETHANE	EPA 8260B	30	ND ug/l	0.210 ug/l*	05/07/10
CARBON TETRACHLORIDE	EPA 8260B	1	ND ug/l	0.280 ug/l*	05/07/10
BENZENE	EPA 8260B	1	ND ug/l	0.220 ug/l*	05/07/10
1,2-DICHLOROETHANE	EPA 8260B	2	ND ug/l	0.240 ug/l*	05/07/10
TRICHLOROETHENE	EPA 8260B	1	ND ug/l	0.250 ug/l*	05/07/10
1,2-DICHLOROPROPANE	EPA 8260B	1	ND ug/l	0.200 ug/l*	05/07/10
BROMODICHLOROMETHANE	EPA 8260B	1	ND ug/l	0.210 ug/l*	05/07/10
4-METHYL-2-PENTANONE	EPA 8260B		ND ug/l	0.440 ug/l*	05/07/10
CIS-1,3-DICHLOROPROPENE	EPA 8260B		ND ug/l	0.220 ug/l*	05/07/10
2-CHLOROETHYL VINYL ETHER	EPA 8260B		ND ug/l	0.940 ug/l*	05/07/10
TOLUENE	EPA 8260B	1000	ND ug/l	0.190 ug/l*	05/07/10
TRANS-1,3-DICHLOROPROPENE	EPA 8260B		ND ug/l	0.220 ug/l*	05/07/10
1,1,2-TRICHLOROETHANE	EPA 8260B	3	ND ug/l	0.240 ug/l*	05/07/10
2-HEXANONE	EPA 8260B		ND ug/l	0.830 ug/l*	05/07/10
TETRACHLOROETHENE	EPA 8260B		ND ug/l	0.370 ug/l*	05/07/10
DIBROMOCHLOROMETHANE	EPA 8260B	1	ND ug/l	0.150 ug/l*	05/07/10
CHLOROBENZENE	EPA 8260B	50	ND ug/l	0.230 ug/l*	05/07/10
ETHYL BENZENE	EPA 8260B	700	ND ug/l	0.230 ug/l*	05/07/10
M&P-XYLENES	EPA 8260B	500	ND ug/l	0.460 ug/l*	05/07/10
O-XYLENE	EPA 8260B		ND ug/l	0.240 ug/l*	05/07/10
STYRENE	EPA 8260B	100	ND ug/l	0.200 ug/l*	05/07/10
BROMOFORM	EPA 8260B	4	ND ug/l	0.310 ug/l*	05/07/10
1,1,2,2-TETRACHLOROETHANE	EPA 8260B	1	ND ug/l	0.320 ug/l*	05/07/10
1,3-DICHLOROBENZENE	EPA 8260B	600	ND ug/l	0.210 ug/l*	05/07/10
1,4-DICHLOROBENZENE	EPA 8260B	75	ND ug/l	0.170 ug/l*	05/07/10
1,2-DICHLOROBENZENE	EPA 8260B	600	ND ug/l	0.200 ug/l*	05/07/10
NONE FOUND	EPA 8260B LIB SR		ND		05/07/10

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05/21/10 08:12am

Account No: W08182, BOOZ ALLEN HAMILTON
Project No: W08182, BOOZ ALLEN HAMILTON

P.O. No:
PWSID No:

Inv. No:

Sample Number	Sample Description	Samp. Date/Time/Temp	Sampled by
L3345323-1	PICATINNY ARSENAL ARDEC-03-01 THROUGH ARDEC-03-10, 1330-1345	05/04/10 01:45pm NA F	Customer Sampled

Parameter	Method	NJ GRD H20	Result	RLs	Test Date
GAS CHROMATOGRAPHY					
TOTAL PETROLEUM HYDROCARBONS	NJDOA QAM-025		ND mg/l	0.899 mg/l	05/13/10

1. Pursuant to NJAC 7:26, Appendix A 1(E), unless otherwise noted, all sample holding times and preservation requirements were met.

- A result of "ND" indicates the concentration of the analyte tested was either not detected or below the RLs.
- Definitions: ND=not detected; NEG=negative; POS=positive; COL=colonies; RLs=laboratory reporting limits; L/A=lab accident; TNTC=too numerous to count; NL=No Permit Limits.
- A result marked with "DRY" indicates that the result was calculated and reported on a dry weight basis.
- All analysis, except field tests are conducted in Southampton, PA unless otherwise identified.
- The test "pH lab" is analyzed upon receipt at the laboratory, the result will not be suitable for regulatory purposes.
- Actual times of analysis for parameters reported <24 hours are available upon request. All testing is conducted within the required holding time unless otherwise noted.
- QC NELAP ID's:PA 09-00131,NJ PA166,FL E87954,NY 11223,CT PH-0768,DE PA-018,KY 90228,MD 206,EPA PA00018.Bioassay:PA 09-03574,NJ PA034,FL E87953,KS E10373,SC 89020001.
- QC STATE ID's:Wind Gap,NJ PA001,PA 48-01334;E RUTHERFORD NJ02015;Vineland NJ06005; Reading PA 06-03543.
- MCL= is the recommended EPA "Maximum Contaminant Level" for a parameter. PLs=customer specific permit limits.
- The reported results relate only to the samples.
- The test results meet all requirements of NELAC unless otherwise specified.
- The report shall not be reproduced except in full without the written consent of the laboratory.

A - The "RLs" represents a reporting/quantitation limit. When an "A" is present immediately following the "RLs" units, the "RLs" is the Method Detection Limit (MDL).

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Thomas J. Hines
Thomas J. Hines, President

QC Laboratories

Analytical Report

nelac ACCREDITED IN ACCORDANCE WITH
05/25/10 09:16am

PAUL DUSENBURY
BOOZ ALLEN HAMILTON
366 NINTH AVENUE, SUITE 103
PICATINNY ARSENAL
DOVER, NJ 07801

Regarding:

PAUL DUSENBURY
BOOZ ALLEN HAMILTON
366 NINTH AVENUE, SUITE 103
PICATINNY ARSENAL
DOVER, NJ 07801

Account No: W08182, BOOZ ALLEN HAMILTON
Project No: W08182, BOOZ ALLEN HAMILTON

P.O. No:
PWSID No:

Inv. No:

Sample Number	Sample Description	Samp. Date/Time/Temp	Sampled by
L3346144-1	PICATINNY ARSENAL ARDEC-07-01 THROUGH ARDEC-07-10, 1400-1412 Received Temp: 39 F Iced (Y/N): Y	05/06/10 02:12pm NA F	Customer Sampled

Parameter	Method	NJ GRD H2O	Result	RLs	Test Date
GENERAL CHEMISTRY					
SULFATE	EPA 300.0	250	7.54 mg/l	5.00 mg/l	05/10/10
ALKALINITY	SM 2320B		13.1 mg/l	2.00 mg/l	05/10/10
PH LAB	SM 4500H+B	6.5-8.5	6.71 units	0.0100 units	05/10/10
AMMONIA NITROGEN AS N LOW LEVE	SM 4500NH3 D		ND mg/l	0.0500 mg/l	05/12/10
PERCHLORATE	EPA 314.0		ND ug/l	5.00 ug/l	05/17/10
BIOCHEMICAL OXYGEN DEMAND	SM 5210B		ND mg/l	2.18 mg/l	05/07/10
CHEMICAL OXYGEN DEMAND	HACH 8000		ND mg/l	10.0 mg/l	05/12/10
TOTAL NITROGEN	LAB CALC		ND mg/l	1.00 mg/l	05/21/10
NITRITE (AS N)	SM 4500NO2 B	1	ND mg/l	0.0200 mg/l	05/07/10
NITRATE AS N LOW LEVEL	SM 4500NO3 F		ND mg/l	0.500 mg/l	05/13/10
TOTAL ORGANIC CARBON	SM 5310C		1.83 mg/l	1.00 mg/l	05/11/10
METALS					
SILVER DISSOLVED	EPA 200.7		ND mg/l	0.00100 mg/l*	05/18/10
ARSENIC DISSOLVED	EPA 200.7		ND mg/l	0.00720 mg/l*	05/18/10
BERYLLIUM DISSOLVED	EPA 200.7		ND mg/l	0.000130 mg/l*	05/18/10
CADMIUM DISSOLVED	EPA 200.7		ND mg/l	0.000183 mg/l*	05/18/10
CHROMIUM DISSOLVED	EPA 200.7		0.000691 B mg/l	0.000305 mg/l*	05/18/10
COPPER DISSOLVED	EPA 200.7		0.00160 B mg/l	0.00110 mg/l*	05/18/10
NICKEL DISSOLVED	EPA 200.7		0.0274 mg/l	0.000452 mg/l*	05/18/10
LEAD DISSOLVED	EPA 200.7		0.00260 B mg/l	0.00240 mg/l*	05/18/10
ANTIMONY DISSOLVED	EPA 200.7		ND mg/l	0.00440 mg/l*	05/18/10
SELENIUM DISSOLVED	EPA 200.7		ND mg/l	0.00870 mg/l*	05/18/10
THALLIUM DISSOLVED	EPA 200.7		ND mg/l	0.00970 mg/l*	05/18/10
ZINC DISSOLVED	EPA 200.7		0.0223 mg/l	0.000397 mg/l*	05/18/10
SILVER	EPA 200.7	0.04	0.00460 mg/l	0.00100 mg/l*	05/18/10
ARSENIC	EPA 200.7	0.003	ND mg/l	0.00720 mg/l*	05/18/10
BERYLLIUM	EPA 200.7	0.001	ND mg/l	0.000130 mg/l*	05/18/10
CADMIUM	EPA 200.7	0.004	ND mg/l	0.000183 mg/l*	05/18/10

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Thomas J. Hines
Thomas J. Hines, President

QC Laboratories

Analytical Report

Account No: W08182, BOOZ ALLEN HAMILTON   P.O. No: Inv. No:
Project No: W08182, BOOZ ALLEN HAMILTON   PWSID No:

Sample Number	Sample Description	Samp. Date/Time/Temp	Sampled by
L3346144-1	PICATINNY ARSENAL ARDEC-07-01 THROUGH ARDEC-07-10, 1400-1412	05/06/10 02:12pm NA F	Customer Sampled

Parameter	Method	NJ GRD H20	Result	RLs	Test Date
CHROMIUM	EPA 200.7	0.07	0.0303 mg/l	0.000305 mg/l*	05/18/10
COPPER	EPA 200.7	1.3	0.0159 mg/l	0.00110 mg/l*	05/18/10
NICKEL	EPA 200.7	0.1	0.0436 mg/l	0.000452 mg/l*	05/18/10
LEAD	EPA 200.7	0.005	ND mg/l	0.00240 mg/l*	05/18/10
ANTIMONY	EPA 200.7	0.006	ND mg/l	0.00440 mg/l*	05/18/10
SELENIUM	EPA 200.7	0.04	ND mg/l	0.00870 mg/l*	05/18/10
THALLIUM	EPA 200.7	0.002	ND mg/l	0.00970 mg/l*	05/18/10
ZINC	EPA 200.7	2	0.0288 mg/l	0.000397 mg/l*	05/18/10
MERCURY DISSOLVED	EPA 245.1		ND mg/l	0.0000350 mg/l*	05/12/10
MERCURY	EPA 245.1	0.002	ND mg/l	0.0000350 mg/l*	05/12/10
GAS CHROMATOGRAPHY MASS SPECTROMETRY; SEMI-VOLATILES					
BIS(2-CHLOROETHYL)ETHER	EPA 8270C		ND ug/l	0.730 ug/l*	05/13/10
ANILINE	EPA 8270C	6	ND ug/l	0.980 ug/l*	05/13/10
PHENOL	EPA 8270C	2000	ND ug/l	0.390 ug/l*	05/13/10
2-CHLOROPHENOL	EPA 8270C	40	ND ug/l	0.660 ug/l*	05/13/10
1,3-DICHLOROBENZENE	EPA 8270C	600	ND ug/l	1.02 ug/l*	05/13/10
1,4-DICHLOROBENZENE	EPA 8270C	75	ND ug/l	1.09 ug/l*	05/13/10
1,2-DICHLOROBENZENE	EPA 8270C	600	ND ug/l	1.06 ug/l*	05/13/10
BENZYL ALCOHOL	EPA 8270C	2000	ND ug/l	0.630 ug/l*	05/13/10
BIS(2-CHLOROISOPROPYL)ETHER	EPA 8270C	300	ND ug/l	0.760 ug/l*	05/13/10
2-METHYLPHENOL	EPA 8270C		ND ug/l	0.530 ug/l*	05/13/10
HEXACHLOROETHANE	EPA 8270C	7	ND ug/l	1.14 ug/l*	05/13/10
N-NITROSO-DI-N-PROPYLAMINE	EPA 8270C	10	ND ug/l	0.670 ug/l*	05/13/10
3&4-METHYLPHENOL	EPA 8270C		ND ug/l	0.780 ug/l*	05/13/10
NITROBENZENE	EPA 8270C	6	ND ug/l	0.580 ug/l*	05/13/10
ISOPHORONE	EPA 8270C	40	ND ug/l	0.510 ug/l*	05/13/10
2-NITROPHENOL	EPA 8270C		ND ug/l	0.550 ug/l*	05/13/10
2,4-DIMETHYLPHENOL	EPA 8270C	100	ND ug/l	1.16 ug/l*	05/13/10
BIS(2-CHLOROETHOXY)METHANE	EPA 8270C		ND ug/l	0.630 ug/l*	05/13/10
2,4-DICHLOROPHENOL	EPA 8270C	20	ND ug/l	0.570 ug/l*	05/13/10
BENZOIC ACID	EPA 8270C	30000	ND ug/l	22.4 ug/l*	05/13/10
1,2,4-TRICHLOROBENZENE	EPA 8270C	9	ND ug/l	1.05 ug/l*	05/13/10
4-CHLOROANILINE	EPA 8270C	30	ND ug/l	1.03 ug/l*	05/13/10
4-CHLORO-3-METHYLPHENOL	EPA 8270C		ND ug/l	0.490 ug/l*	05/13/10
HEXACHLOROCYCLOPENTADIENE	EPA 8270C	40	ND ug/l	1.32 ug/l*	05/13/10
2,4,6-TRICHLOROPHENOL	EPA 8270C	20	ND ug/l	0.540 ug/l*	05/13/10
2,4,5-TRICHLOROPHENOL	EPA 8270C	700	ND ug/l	0.480 ug/l*	05/13/10
2-CHLORONAPHTHALENE	EPA 8270C	600	ND ug/l	1.07 ug/l*	05/13/10
2-NITROANILINE	EPA 8270C		ND ug/l	0.680 ug/l*	05/13/10
DIMETHYLPHTHALATE	EPA 8270C		ND ug/l	0.690 ug/l*	05/13/10
2,6-DINITROTOLUENE	EPA 8270C	10	ND ug/l	0.560 ug/l*	05/13/10
3-NITROANILINE	EPA 8270C		ND ug/l	0.560 ug/l*	05/13/10

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Thomas J. Hines
Thomas J. Hines, President

QC Laboratories

Analytical Report

05/25/10 09:16am

Account No: W08182, BOOZ ALLEN HAMILTON P.O. No: Inv. No:
Project No: W08182, BOOZ ALLEN HAMILTON PWSID No:

Sample Number	Sample Description	Samp. Date/Time/Temp	Sampled by
L3346144-1	PICATINNY ARSENAL ARDEC-07-01 THROUGH ARDEC-07-10, 1400-1412	05/06/10 02:12pm NA F	Customer Sampled

Parameter	Method	NJ GRD H20	Result	RLs	Test Date
2,4-DINITROPHENOL	EPA 8270C	40	ND ug/l	1.57 ug/l*	05/13/10
DIBENZOFURAN	EPA 8270C		ND ug/l	0.670 ug/l*	05/13/10
2,4-DINITROTOLUENE	EPA 8270C	10	ND ug/l	0.500 ug/l*	05/13/10
4-NITROPHENOL	EPA 8270C		ND ug/l	1.11 ug/l*	05/13/10
4-CHLOROPHENYL-PHENYLETHER	EPA 8270C		ND ug/l	0.830 ug/l*	05/13/10
DIETHYLPHTHALATE	EPA 8270C	6000	ND ug/l	0.770 ug/l*	05/13/10
4-NITROANILINE	EPA 8270C		ND ug/l	0.940 ug/l*	05/13/10
4,6-DINITRO-2-METHYLPHENOL	EPA 8270C		ND ug/l	0.480 ug/l*	05/13/10
N-NITROSODIPHENYLAMINE	EPA 8270C	200	ND ug/l	0.680 ug/l*	05/13/10
1,2-DIPHENYLHYDRAZINE	EPA 8270C	20	ND ug/l	0.540 ug/l*	05/13/10
4-BROMOPHENYL-PHENYLETHER	EPA 8270C		ND ug/l	0.740 ug/l*	05/13/10
CARBAZOLE	EPA 8270C		ND ug/l	0.760 ug/l*	05/13/10
DI-N-BUTYLPHTHALATE	EPA 8270C	700	ND ug/l	0.840 ug/l*	05/13/10
BENZIDINE	EPA 8270C	20	ND ug/l	14.3 ug/l*	05/13/10
BUTYLBENZYLPHTHALATE	EPA 8270C	100	ND ug/l	0.710 ug/l*	05/13/10
3,3'-DICHLOROBENZIDINE	EPA 8270C	30	ND ug/l	0.350 ug/l*	05/13/10
BIS(2-ETHYLHEXYL)PHTHALATE	EPA 8270C		ND ug/l	0.780 ug/l*	05/13/10
DI-N-OCTYLPHTHALATE	EPA 8270C	100	ND ug/l	0.920 ug/l*	05/13/10
DIETHYLTOLUAMIDE	EPA 8270C LIB SR		7.21 JN ug/l		05/13/10
N-NITROSODIMETHYLAMINE	EPA 8270C	0.8	ND ug/l	0.01 ug/l*	05/13/10
NAPHTHALENE	EPA 8270C	300	ND ug/l	0.02 ug/l*	05/13/10
HEXACHLOROBUTADIENE	EPA 8270C	1	ND ug/l	0.02 ug/l*	05/13/10
2-METHYLNAPHTHALENE	EPA 8270C		0.04 ug/l	0.02 ug/l*	05/13/10
ACENAPHTHYLENE	EPA 8270C		0.02 ug/l	0.02 ug/l*	05/13/10
ACENAPHTHENE	EPA 8270C	400	0.02 ug/l	0.02 ug/l*	05/13/10
FLUORENE	EPA 8270C	300	ND ug/l	0.02 ug/l*	05/13/10
HEXACHLOROBENZENE	EPA 8270C	0.02	ND ug/l	0.02 ug/l*	05/13/10
PENTACHLOROPHENOL	EPA 8270C	0.3	ND ug/l	0.02 ug/l*	05/13/10
PHENANTHRENE	EPA 8270C		ND ug/l	0.03 ug/l*	05/13/10
ANTHRACENE	EPA 8270C	2000	ND ug/l	0.01 ug/l*	05/13/10
FLUORANTHENE	EPA 8270C	300	ND ug/l	0.02 ug/l*	05/13/10
PYRENE	EPA 8270C	200	ND ug/l	0.03 ug/l*	05/13/10
BENZO(A)ANTHRACENE	EPA 8270C	0.1	ND ug/l	0.02 ug/l*	05/13/10
CHRYSENE	EPA 8270C	5	ND ug/l	0.03 ug/l*	05/13/10
BENZO(B)FLUORANTHENE	EPA 8270C	0.2	ND ug/l	0.03 ug/l*	05/13/10
BENZO(K)FLUORANTHENE	EPA 8270C	0.5	ND ug/l	0.02 ug/l*	05/13/10
BENZO(A)PYRENE	EPA 8270C	0.1	ND ug/l	0.01 ug/l*	05/13/10
INDENO(1,2,3-CD)PYRENE	EPA 8270C	0.2	ND ug/l	0.03 ug/l*	05/13/10
DIBENZ(A,H)ANTHRACENE	EPA 8270C	0.3	ND ug/l	0.03 ug/l*	05/13/10
BENZO(G,H,I)PERYLENE	EPA 8270C		ND ug/l	0.02 ug/l*	05/13/10
GAS CHROMATOGRAPHY MASS SPECTROMETRY; VOLATILES					
CHLOROMETHANE	EPA 8260B		ND ug/l	0.320 ug/l*	05/11/10

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Thomas J. Hines
Thomas J. Hines, President

QC Laboratories

Analytical Report

05/25/10 09:16am

Account No: W08182, BOOZ ALLEN HAMILTON
Project No: W08182, BOOZ ALLEN HAMILTON
P.O. No:
PWSID No:
Inv. No:

Sample Number: L3346144-1
Sample Description: PICATINNY ARSENAL ARDEC-07-01 THROUGH ARDEC-07-10, 1400-1412
Samp. Date/Time/Temp: 05/06/10 02:12pm NA F
Sampled by: Customer Sampled

Parameter	Method	NJ GRD H20	Result	RLs	Test Date
GAS CHROMATOGRAPHY					
TOTAL PETROLEUM HYDROCARBONS	NJOQA QAM-025		ND mg/l	0.909 mg/l	05/13/10

L3346144-1:
1. QUALIFIERS: For metals parameters;"B" indicates a value that is > than the MDL but < than the laboratory quantitation limit. For Organics parameters; "B"is when the compound is found in the blank as well as in the sample;"J"indicates a value that is > than the MDL but < than the lowest standard, it is also used to indicate that a compound is tentatively identified in a library search;"E"(estimated) is when a compound exceeded the calibration range;"N" presumptive evidence of a compound; "D" is when a dilution was required.

2. Pursuant to NJAC 7:26, Appendix A 1(E), unless otherwise noted, all sample holding times and preservation requirements were met.

- A result of "ND" indicates the concentration of the analyte tested was either not detected or below the RLs.
- Definitions: ND=not detected; NEG=negative; POS=positive; COL=colonies; RLs=laboratory reporting limits; L/A=lab accident; TNTC=too numerous to count; NL=No Permit Limits.
- A result marked with "DRY" indicates that the result was calculated and reported on a dry weight basis.
- All analysis, except field tests are conducted in Southampton, PA unless otherwise identified.
- The test"pH lab"is analyzed upon receipt at the laboratory, the result will not be suitable for regulatory purposes.
- Actual times of analysis for parameters reported <24 hours are available upon request. All testing is conducted within the required holding time unless otherwise noted.
- QC NELAP ID's:PA 09-00131,NJ PA166,FL E87964,NY 11223,CT PH-0768,DE PA-018,KY 90228,MD 206,EPA PA00018.Bioassay:PA 09-03574,NJ PA034,FL E87953,KS E10373,SC 89020001.
- QC STATE ID's:Wind Gap,NJ PA001,PA 48-01334;E RUTHERFORD NJ02015;Vineland NJ06005; Reading PA 06-03543.
- MCL= is the recommended EPA "Maximum Contaminant Level" for a parameter. PLs=customer specific permit limits.
- The reported results relate only to the samples.
- The test results meet all requirements of NELAC unless otherwise specified.
- The report shall not be reproduced except in full without the written consent of the laboratory.
* - The "RLs" represents a reporting/quantitation limit. When an "*" is present immediately following the "RLs" units, the "RLs" is the Method Detection Limit (MDL).

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Thomas J. Hines
Thomas J. Hines, President

QC Laboratories

Analytical Report

NELAC — ACCREDITED IN ACCORDANCE WITH
05/25/10 09:16am

Account No: W08182, BOOZ ALLEN HAMILTON
Project No: W08182, BOOZ ALLEN HAMILTON

P.O. No:
PWSID No:

Inv. No:

Sample Number	Sample Description	Samp. Date/Time/Temp	Sampled by
L3346144-1	PICATINNY ARSENAL ARDEC-07-01 THROUGH ARDEC-07-10, 1400-1412	05/06/10 02:12pm NA F	Customer Sampled

Parameter	Method	NJ GRD H20	Result	RLs	Test Date
VINYL CHLORIDE	EPA 8260B	1	ND ug/l	0.240 ug/l*	05/11/10
BROMOMETHANE	EPA 8260B	10	ND ug/l	0.480 ug/l*	05/11/10
CHLOROETHANE	EPA 8260B		ND ug/l	0.310 ug/l*	05/11/10
ACROLEIN	EPA 8260B	5	ND ug/l	2.61 ug/l*	05/11/10
ACRYLONITRILE	EPA 8260B	2	ND ug/l	1.15 ug/l*	05/11/10
1,1-DICHLOROETHENE	EPA 8260B		ND ug/l	0.310 ug/l*	05/11/10
ACETONE	EPA 8260B	6000	ND ug/l	3.26 ug/l*	05/11/10
CARBON DISULFIDE	EPA 8260B	700	ND ug/l	0.640 ug/l*	05/11/10
METHYLENE CHLORIDE	EPA 8260B	3	ND ug/l	0.500 ug/l	05/11/10
TRANS-1,2-DICHLOROETHENE	EPA 8260B	100	ND ug/l	0.180 ug/l*	05/11/10
1,1-DICHLOROETHANE	EPA 8260B	50	ND ug/l	0.240 ug/l*	05/11/10
VINYL ACETATE	EPA 8260B	7000	ND ug/l	0.610 ug/l*	05/11/10
2-BUTANONE	EPA 8260B	300	ND ug/l	0.590 ug/l*	05/11/10
CIS-1,2-DICHLOROETHENE	EPA 8260B	70	ND ug/l	0.280 ug/l*	05/11/10
CHLOROFORM	EPA 8260B	70	ND ug/l	0.230 ug/l*	05/11/10
1,1,1-TRICHLOROETHANE	EPA 8260B	30	ND ug/l	0.210 ug/l*	05/11/10
CARBON TETRACHLORIDE	EPA 8260B	1	ND ug/l	0.280 ug/l*	05/11/10
BENZENE	EPA 8260B	1	ND ug/l	0.220 ug/l*	05/11/10
1,2-DICHLOROETHANE	EPA 8260B	2	ND ug/l	0.240 ug/l*	05/11/10
TRICHLOROETHENE	EPA 8260B	1	ND ug/l	0.250 ug/l*	05/11/10
1,2-DICHLOROPROPANE	EPA 8260B	1	ND ug/l	0.200 ug/l*	05/11/10
BROMODICHLOROMETHANE	EPA 8260B	1	ND ug/l	0.210 ug/l*	05/11/10
4-METHYL-2-PENTANONE	EPA 8260B		ND ug/l	0.440 ug/l*	05/11/10
CIS-1,3-DICHLOROPROPENE	EPA 8260B		ND ug/l	0.220 ug/l*	05/11/10
2-CHLOROETHYL VINYL ETHER	EPA 8260B		ND ug/l	0.940 ug/l*	05/11/10
TOLUENE	EPA 8260B	1000	ND ug/l	0.190 ug/l*	05/11/10
TRANS-1,3-DICHLOROPROPENE	EPA 8260B		ND ug/l	0.220 ug/l*	05/11/10
1,1,2-TRICHLOROETHANE	EPA 8260B	3	ND ug/l	0.240 ug/l*	05/11/10
2-HEXANONE	EPA 8260B		ND ug/l	0.830 ug/l*	05/11/10
TETRACHLOROETHENE	EPA 8260B		ND ug/l	0.370 ug/l*	05/11/10
DIBROMOCHLOROMETHANE	EPA 8260B	1	ND ug/l	0.150 ug/l*	05/11/10
CHLOROBENZENE	EPA 8260B	50	ND ug/l	0.230 ug/l*	05/11/10
ETHYL BENZENE	EPA 8260B	700	ND ug/l	0.230 ug/l*	05/11/10
M&P-XYLENES	EPA 8260B	500	ND ug/l	0.460 ug/l*	05/11/10
O-XYLENE	EPA 8260B		ND ug/l	0.240 ug/l*	05/11/10
STYRENE	EPA 8260B	100	ND ug/l	0.200 ug/l*	05/11/10
BROMOFORM	EPA 8260B	4	ND ug/l	0.310 ug/l*	05/11/10
1,1,2,2-TETRACHLOROETHANE	EPA 8260B	1	ND ug/l	0.320 ug/l*	05/11/10
1,3-DICHLOROBENZENE	EPA 8260B	600	ND ug/l	0.210 ug/l*	05/11/10
1,4-DICHLOROBENZENE	EPA 8260B	75	ND ug/l	0.170 ug/l*	05/11/10
1,2-DICHLOROBENZENE	EPA 8260B	600	ND ug/l	0.200 ug/l*	05/11/10
NONE FOUND	EPA 8260B LIB SR		ND		05/11/10

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Thomas J. Hines
Thomas J. Hines, President

ATTACHMENT 2

Core Sample Carbon Content

and Permeability Analyses

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Client:	Booz Allen Hamilton
Project Name:	Picatinny Aresenal
Project Location:	NJ
GTX #:	10059
Test Date:	8/3/2010
Tested By:	jht
Checked By:	mpd

Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 2

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
---	ARDEC 01	26	0.07	170	2.71	0.00

Notes: Results are based on the average of three saw-cut test specimens.
Unit weight obtained by digital caliper measurement.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Booz Allen Hamilton
Project Name:	Picatinny Aresenal
Project Location:	NJ
GTX #:	10059
Test Date:	8/3/2010
Tested By:	jht
Checked By:	mpd

Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 2

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
---	ARDEC 03	106	0.04	163	2.52	0.00

Notes: Results are based on the average of three saw-cut test specimens.
Unit weight obtained by digital caliper measurement.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Booz Allen Hamilton
Project Name:	Picatinny Aresenal
Project Location:	NJ
GTX #:	10059
Test Date:	8/3/2010
Tested By:	jht
Checked By:	mpd

Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 2

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
---	ARDEC 03	126	0.09	164	2.61	0.01

Notes: Results are based on the average of three saw-cut test specimens.
Unit weight obtained by digital caliper measurement.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

Client:	Booz Allen Hamilton
Project Name:	Picatinny Aresenal
Project Location:	NJ
GTX #:	10059
Test Date:	8/3/2010
Tested By:	jht
Checked By:	mpd

Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 2

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
---	ARDEC 04	21	0.09	169	2.72	0.00

Notes: Results are based on the average of three saw-cut test specimens.
Unit weight obtained by digital caliper measurement.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

GeoTesting express
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Client:	Booz Allen Hamilton
Project Name:	Picatinny Aresenal
Project Location:	NJ
GTX #:	10059
Test Date:	8/3/2010
Tested By:	jht
Checked By:	mpd

Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 2

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
---	ARDEC 07	59	0.09	168	2.60	0.00

Notes: Results are based on the average of three saw-cut test specimens.
Unit weight obtained by digital caliper measurement.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

Client:	Booz Allen Hamilton
Project Name:	Picatinny Arsenal
Project Location:	---
GTX #:	10059
Test Date:	10/05/10
Tested By:	ea
Checked By:	mpd
Boring ID:	---
Sample ID:	ARDEC 01 4525
Depth, ft:	14
Sample Description:	rock core

Permeability of Rocks by Flowing Air by ASTM D 4525

Specimen Height, m:	0.100
Specimen Diameter, m:	0.063
Specimen Mass, kg:	0.818
Specimen Unit Weight, kg/m³:	2,595

Cell Pressure, Pa	Sample Pressure, Pa	Inlet Pressure, P_i Pa	Outlet Pressure, P_e, Pa	Flow, Q_e m³/s	Coefficient of Permeability, k m²	1/Mean Pressure Pa	Comments
758,424	689,476	690,165	110	0	---	---	No air flow could be measured
758,424	551,581	554,780	110	0	---	---	No air flow could be measured
758,424	344,738	347,841	110	0	---	---	No air flow could be measured

No Air Flow could be measured at maximum laboratory air pressure of 758,424 Pa.

Equivalent Liquid Permeability could not be determined for the rock specimen.

***Equivalent Liquid Permeability at 20° C: (see below)**

Notes: Permeability of the test specimen is below the recommended limits of ASTM D 4525 test method.
Unable to extropolate data to obtain a value of Equivalent Liquid Permeability.
Permeability limit of the test method is 9.9×10^{-13} m²
Minimum air permeability could not be measured.

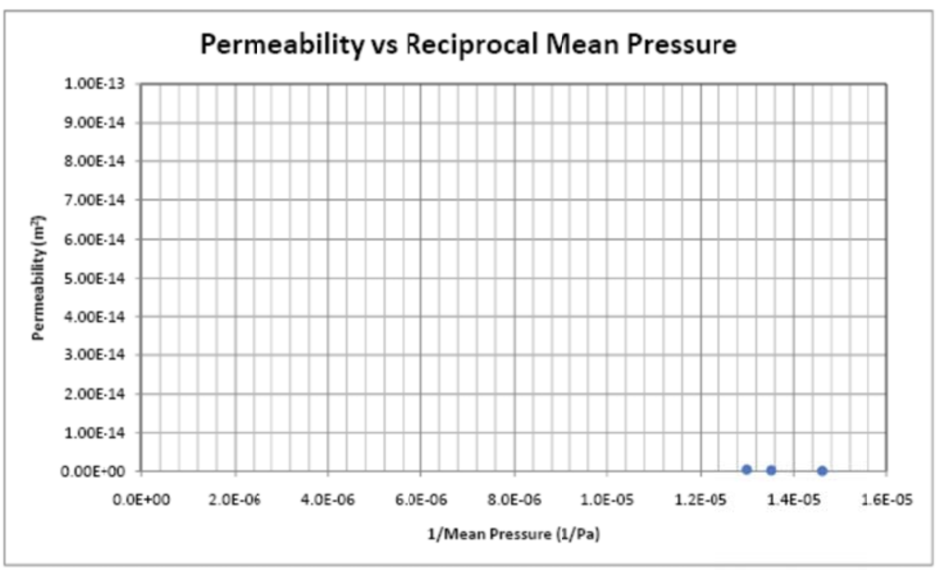
GeoTesting EXPRESS

Client:	Booz Allen Hamilton
Project Name:	Picatinny Arsenal
Project Location:	---
GTX #:	10059
Test Date:	09/30/10
Tested By:	ea
Checked By:	mpd
Boring ID:	---
Sample ID:	ARDEC 03 4525
Depth, ft:	71
Sample Description:	rock core

Permeability of Rocks by Flowing Air by ASTM D 4525

Specimen Height, m:	0.076
Specimen Diameter, m:	0.048
Specimen Mass, kg:	0.354
Specimen Unit Weight, kg/m^3:	2,600

Cell Pressure, Pa	Sample Pressure, Pa	Inlet Pressure, P_i Pa	Outlet Pressure, P_o, Pa	Flow, Q_o m^3/s	Coefficient of Permeability, k m^2	1/Mean Pressure Pa	Comments
172,369	137,895	136,516	384	1.67E-06	5.38E-17	1.46E-05	
172,369	149,409	146,996	878	3.75E-06	2.39E-16	1.35E-05	
172,369	155,132	152,443	1,372	4.83E-06	4.47E-16	1.30E-05	



***Equivalent Liquid Permeability at 20° C: (see below)**

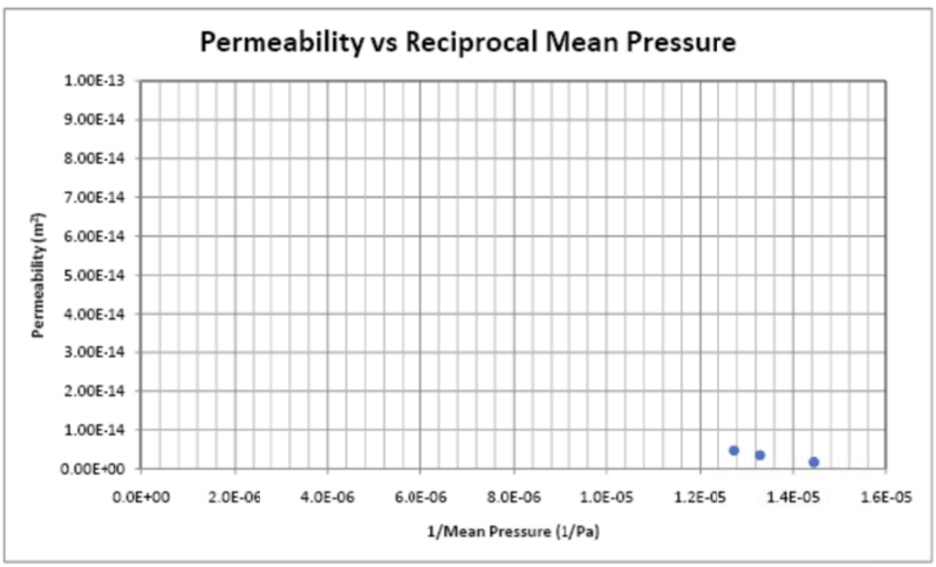
Notes: Permeability of the test specimen is below the recommended limits of ASTM D 4525 test method.
Unable to extropolate data to obtain a value of Equivalent Liquid Permeability.
Permeability limit of the test method is 9.9 x 10^{-13} m^2
Minimum air permeability measured was 5.4 x 10^{-17} m^2

Client:	Booz Allen Hamilton
Project Name:	Picatinny Arsenal
Project Location:	---
GTX #:	10059
Test Date:	10/01/10
Tested By:	ea
Checked By:	mpd
Boring ID:	---
Sample ID:	ARDEC 03 4525
Depth, ft:	92
Sample Description:	rock core

Permeability of Rocks by Flowing Air by ASTM D 4525

Specimen Height, m:	0.076
Specimen Diameter, m:	0.047
Specimen Mass, kg:	0.358
Specimen Unit Weight, kg/m³:	2,648

Cell Pressure, Pa	Sample Pressure, Pa	Inlet Pressure, P_i Pa	Outlet Pressure, P_o, Pa	Flow, Q_a m^3/s	Coefficient of Permeability, k m^2	1/Mean Pressure Pa	Comments
172,369	137,895	136,109	2,359	8.34E-06	1.68E-15	1.44E-05	
172,369	149,409	146,334	4,060	1.17E-05	3.51E-15	1.33E-05	
172,369	155,132	151,754	5,213	1.32E-05	4.73E-15	1.27E-05	



***Equivalent Liquid Permeability at 20° C: (see below)**

Notes: Permeability of the test specimen is below the recommended limits of ASTM D 4525 test method.
Unable to extropolate data to obtain a value of Equivalent Liquid Permeability.
Permeability limit of the test method is 9.9×10^{-13} m²
Minimum air permeability measured was 1.7×10^{-15} m²

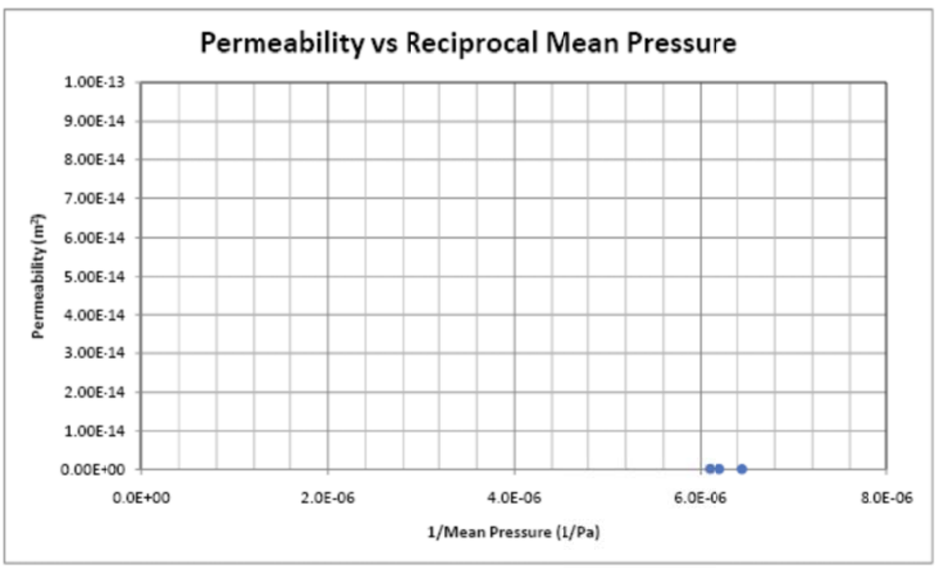
GeoTesting EXPRESS

Client:	Booz Allen Hamilton
Project Name:	Picatinny Arsenal
Project Location:	---
GTX #:	10059
Test Date:	09/29/10
Tested By:	ea
Checked By:	mpd
Boring ID:	---
Sample ID:	ARDEC 04 4525
Depth, ft:	56
Sample Description:	rock core

Permeability of Rocks by Flowing Air by ASTM D 4525

Specimen Height, m:	0.074
Specimen Diameter, m:	0.047
Specimen Mass, kg:	0.345
Specimen Unit Weight, kg/m^3:	2,670

Cell Pressure, Pa	Sample Pressure, Pa	Inlet Pressure, P_i Pa	Outlet Pressure, P_o, Pa	Flow, Q_o m^3/s	Coefficient of Permeability, k m^2	1/Mean Pressure Pa	Comments
344,738	310,264	309,161	823	3.75E-06	5.11E-17	6.45E-06	
344,738	321,778	320,979	1,262	5.00E-06	9.68E-17	6.21E-06	
344,738	327,501	326,260	1,646	5.83E-06	1.43E-16	6.10E-06	



***Equivalent Liquid Permeability at 20° C: (see below)**

Notes: Permeability of the test specimen is below the recommended limits of ASTM D 4525 test method.
Unable to extropolate data to obtain a value of Equivalent Liquid Permeability.
Permeability limit of the test method is 9.9 × 10^{-13} m^2
Minimum air permeability measured was 5.1 × 10^{-17} m^2

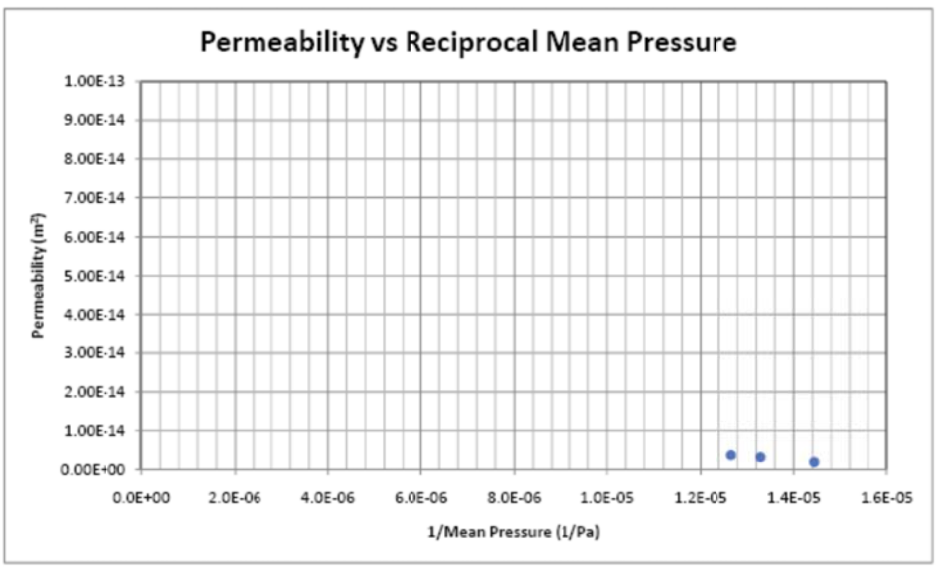
GeoTesting EXPRESS

Client:	Booz Allen Hamilton
Project Name:	Picatinny Arsenal
Project Location:	---
GTX #:	10059
Test Date:	09/29/10
Tested By:	ea
Checked By:	mpd
Boring ID:	---
Sample ID:	ARDEC 07 4525
Depth, ft:	32
Sample Description:	rock core

Permeability of Rocks by Flowing Air by ASTM D 4525

Specimen Height, m:	0.075
Specimen Diameter, m:	0.047
Specimen Mass, kg:	0.358
Specimen Unit Weight, kg/m^3:	2,690

Cell Pressure, Pa	Sample Pressure, Pa	Inlet Pressure, P_i Pa	Outlet Pressure, P_o, Pa	Flow, Q_o m^3/s	Coefficient of Permeability, k m^2	1/Mean Pressure Pa	Comments
172,369	137,895	135,206	3,278	6.92E-06	1.94E-15	1.44E-05	
172,369	149,409	146,114	4,335	1.00E-05	3.18E-15	1.33E-05	
172,369	155,132	152,788	5,103	1.08E-05	3.71E-15	1.27E-05	



***Equivalent Liquid Permeability at 20° C: (see below)**

Notes: Permeability of the test specimen is below the recommended limits of ASTM D 4525 test method.
Unable to extropolate data to obtain a value of Equivalent Liquid Permeability.
Permeability limit of the test method is 9.9 x 10^{-13} m^2
Minimum air permeability measured was 1.9 x 10^{-15} m^2

ATTACHMENT 3

Blast-Induced Crack Propagation

CONTINENTAL PLACER INC.

II Winners Circle
Albany, NY 12205
(518) 458-9203 Fax (518) 458-9206
www.continentalplacer.com

September 1, 2009

Mr. Nathan Moore
Continental Placer Inc.
5010 Lenker Street
Mechanicsburg, PA 17050

RE: Blast Induced Crack Propagation

Nate:

The ability of a detonated column charge to load bedrock in its vicinity to failure and produce crushing and propagation of cracks, is very limited because of the high compressive strength of bedrock and the near-vertical slope of the vibration decay line in the vicinity of a column charge. The failure or crater zone of a blast, where this can occur, is limited to approximately 20-40 borehole diameters, depending primarily upon rock type (Figure 1, also see Table 1). Outside the failure zone, bedrock, although brittle, responds elastically. A typical stress-strain curve for a brittle material is shown in Figure 2. Compressive loading above the elastic limit, which for a brittle material is the same as the yield point, results in brittle failure that occurs within the "failure" zone, by definition. Compressive loading below the elastic limit does not result in failure or permanent deformation. Bedrock subjected to compressive loading within this region, outside the crater or failure zone, responds elastically with no permanent deformation.

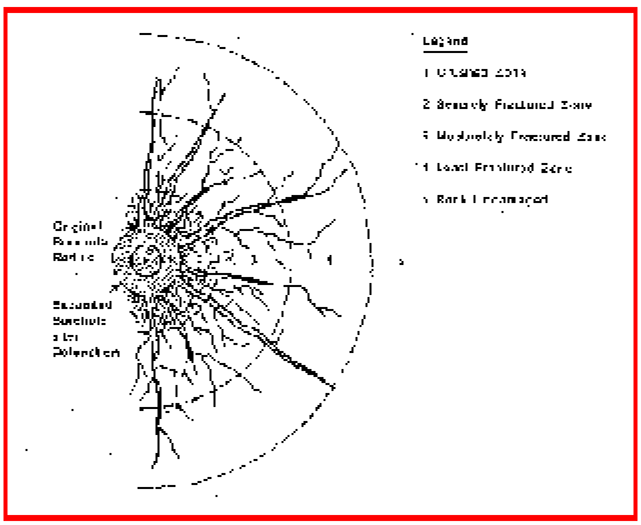


Figure 1: Zones of Fracture Radius ("Explosives and Rock Blasting", Atlas Powder, 1987)

Blast Induce Crack Propagation
9/1/09

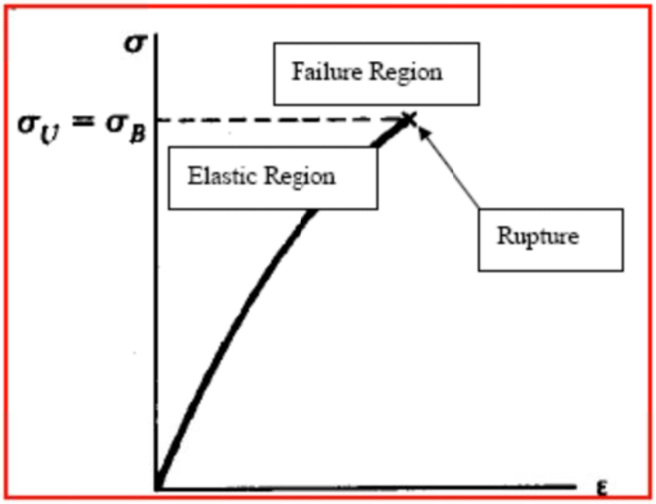


Figure 2: Stress-strain Diagram for Typical Brittle Material. (modified after Beer and Johnston, 1981)

For blasting conducted on this project, assuming a three inch diameter drill hole, crack propagation would be limited to approximately six to twelve lateral feet outside the perimeter of the outside drill holes in the pattern. Although there would be crushing at the bottom of each vertically drilled hole, there would be little to no crack propagation below this elevation. These cracking limitations are reflected in standard blast design criteria that require close spacing of column charges to produce adequate propagation. Drill holes for commercial blasting are drilled in a pattern (burden X spacing) to distribute the explosives in the rock and obtain adequate breakage. Sub-drilling of several feet below final grade in done to avoid high bottom, in recognition of poor crack extension at the bottom of the drill hole.

As a blast-induced stress wave propagates through bedrock, forcing the ground to move in an elliptical manner in three dimensions, the stress wave expands spherically, doing work on progressively larger volumes of rock. As a consequence, theoretical decay lines predicting the decay of vibration with distance from blasting are not linear, but logarithmic. Slopes of theoretical decay lines are very steep near the column charges indicating an initial high rate of energy loss in crushing and cracking bedrock near the column charges. This has important implications regarding the limited ability of blast-induced stress waves to do work on bedrock.

Blast Induce Crack Propagation
9/1/09

Table 1: Degree of Damage around a Drill Hole in Terms of Charge Radii ("Explosives and Rock Blasting", Atlas Powder, 1987)

Source	Explosive	Explosive amount	Charge shape	Material or rock type	Crushed zone in charge radii (max)	Radius of damage in charge radii (max)	Comments
Olsen et al.[7]	C4	0.25 kg	S	Granite	—	18	
		2.00 kg	S	Granite	—	20	
Siskind et al.[8]	60% Dynamite	—	C	Shale	—	45-55	
	ANFO	—	C	Shale	—	15-22	
Cattermole & Hanson[9]	60% Dynamite	—	C	Tuffaceous Pyroclastic	3.0	20-30	
Colorado School of Mines[10]	—	—	—	Soft rock	—	25-29	
	—	—	—	Hard rock	—	20-23	
Derlich[11]	Nuclear (TNT)	—	—	Granite	1.9	4.9	
Atchison & Tournay[12]	—	3.6 kg (max)	C	Granite	3-4.5	—	
D'Andrea et al.[13]	C4	0.0016 kg to 0.467 kg	S	Granite	2.3	—	
Siskind & Fumanti[14]	ANFO	—	C	Granite	—	14	
Kutter & Fairhurst[6]	Underwater spark discharge	—	S	Plexiglas & rock	—	6	Theoretically calculated
			C	Plexiglas & rock	—	9	Theoretically calculated
Vovk et al.[15]	—	—	—	Granite, lime-stone & concrete	8-12	30-50	
Borg[16]	Nuclear	—	—	Competent	2.7-3.5 2.0	—	Horizontal fracturing below shot point

Please call if you have any questions or need more information.

Sincerely,

Brent J. Tardif, PG
Senior Vice President

3

ATTACHMENT 4

Field Report

Field Report

ARDEC is planning to construct an underground explosives test chamber and is evaluating National Environmental Policy Act (NEPA) impacts of the proposed facility through the production of an Environmental Assessment. Evaluating the impact of the SAFER chamber construction and long term impact to the local surface and groundwater is a major decision point in this EA effort. Booz Allen Hamilton provided groundwater modeling assistance for this project. Preliminary consultation with ARDEC determined that it would be beneficial for personnel to travel to the site during the initial geotechnical drilling program and to assist gathering baseline information on Green Pond Brook. The goal of the on-site programs was to obtain site-specific information on groundwater and surface water that could be used for the modeling effort. Site visits were conducted during the time frame of April 27-May 10 and 19-23 July 2010.

Seven geotechnical core samples were drilled at the locations shown on Figure A-1. Selected intervals from this rock core were sent to laboratories for rock mechanics testing for tunnel and chamber stability evaluation, and trace metals, carbon content, porosity, and permeability for fate and transport modeling of possible contaminant release during construction and operation of the SAFER chamber.

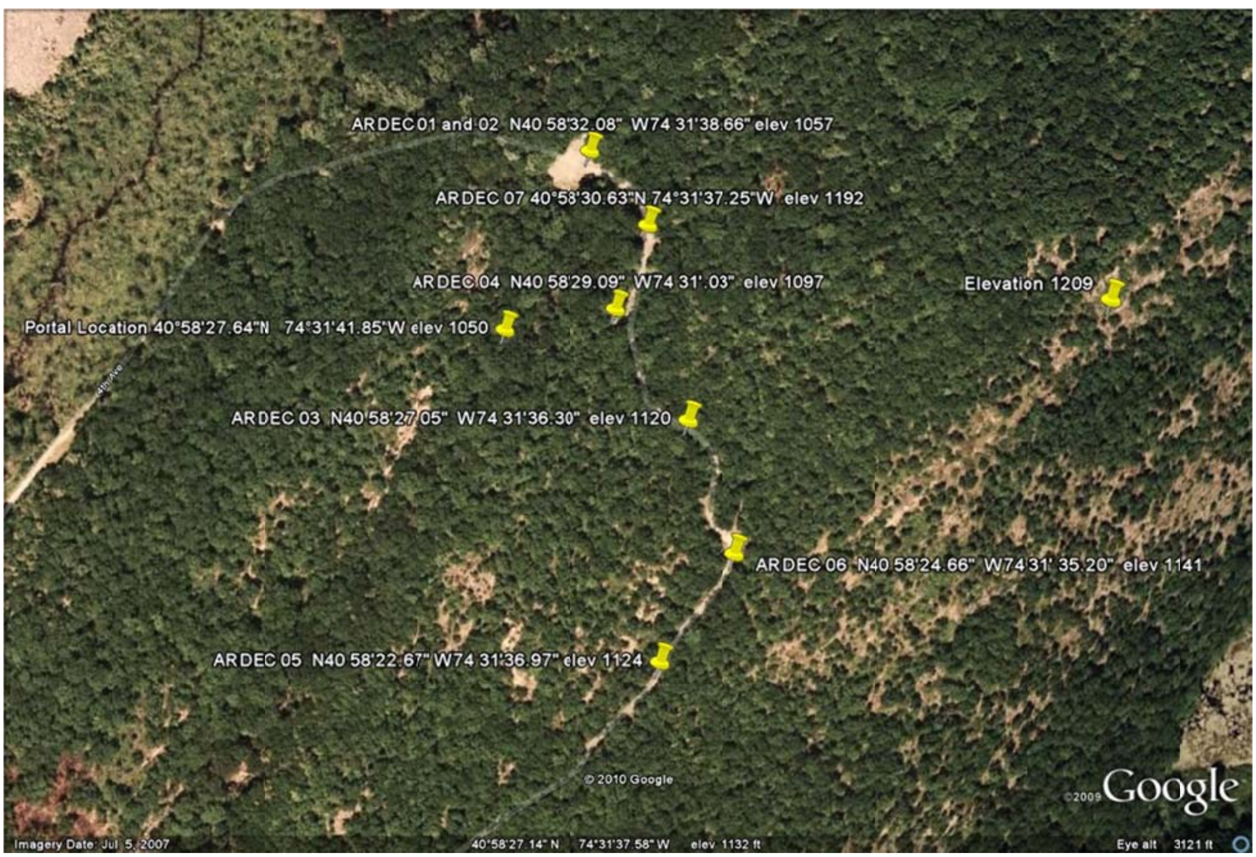


Figure A-1. Drill Hole Location Map.

The geotechnical drilling was conducted during 27 April – 10 May. The mining contractor for the chamber construction- Continental Placer Incorporated (CPI) - was on-site managing the drilling program and classifying/logging the drill core samples. The contractor conducting the EA for the SAFER project, Booz Allen Hamilton, was also on site at this time and was conducting hydrologic pump tests/slug tests on selected drill holes. The week before the drilling operation, the project area experienced heavy rains and melting of remaining snowpack from the previous winter. This water resulted in a very heavy surface flow and saturation of the rubble zone above the Green Pond Conglomerate formation. As the holes were drilled, static water levels were measured and a geosquirt/grundfos pump was installed in the well to obtain hydrologic data.

Figure A-2 illustrates a typical drilling equipment configuration. Boart-Longyear was contracted to conduct the drilling and used an NX core barrel to obtain the geotechnical samples. A NX drill bit makes a hole approximately three inches in diameter. Figure A-3 illustrates a typical section of the rock core that is obtained during the drilling operation.

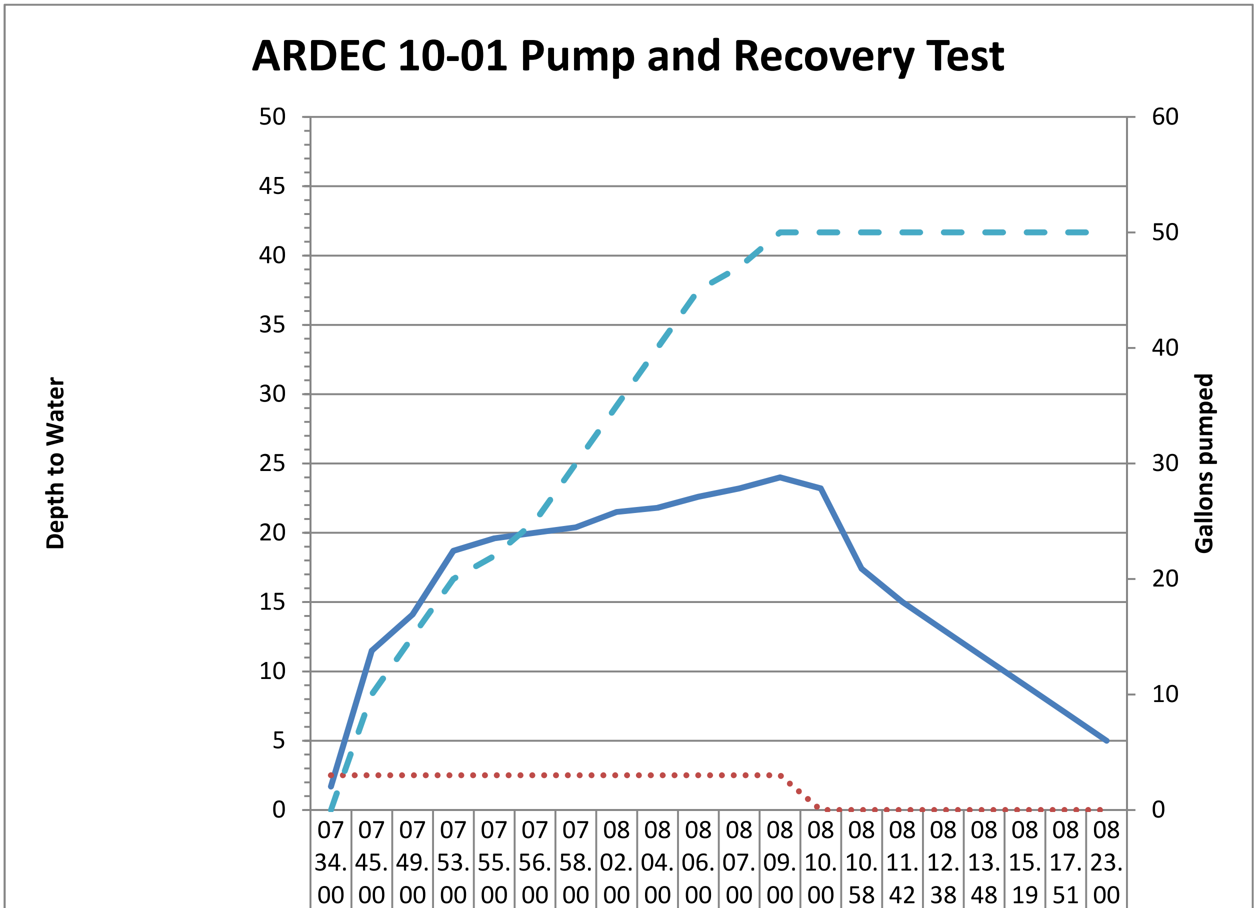
Figure A-2. Drilling Rig Operation.

Figure A-3. Drill Core Classification and Storage, ARDEC 10-01.

After selected holes were drilled, a grundfos pump was set in the hole and operated to obtain hydrologic information, field chemical parameter readings using hydrocell technology, and samples for laboratory analysis. Figure A-4 shows the pump set-up on drill hole ARDEC 10-03. This hole was 200 feet deep and the pump was set at 170 feet.

Figure A-4. Grundfos Pump in Drill Hole, ARDEC 10-03.

Figure A-5 illustrates the type of data that was obtained from the pump tests in the ARDEC drill holes. Pumping rate, water table drawdown rate, and recovery rate were charted. This data was used with other published Picatinny Arsenal groundwater data to establish input parameters for the groundwater model.



	0734.00	0745.00	0749.00	0753.00	0755.00	0756.00	0758.00	0802.00	0804.00	0806.00	0807.00	0809.00	0810.00	0810.58	0811.42	0812.38	0813.48	0815.19	0817.51	0823.00
depth to water	1.7	12	14	19	20	20	20	22	22	23	23	24	23	17	15	13	11	9	7	5
gpm	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	0	0	0	0	0	0	0	0
gal pumped	0	10	15	20	22	25	30	35	40	45	47	50	50	50	50	50	50	50	50	50

Figure A-5. Pump and Recovery Test.

Through discussions with ARDEC, it was determined there were data gaps concerning Green Pond Brook. The EA needs to evaluate the impact that the SAFER construction and operation will have on this body of water. The underlying data gap premise focused on the water chemistry, potential trout habitat, and stream flow.

During the time period 19-23 July, 2010 a team of scientists and a representative of the Picatinny Arsenal Environmental Affairs Office obtained baseline data from Green Pond Brook. The section of the Brook from just below the entry gate to the Gorge up through the Open Burn Open Detonation area, to include the adjacent spring, were inventoried. See Figure A-6 for a map of the sample sites.

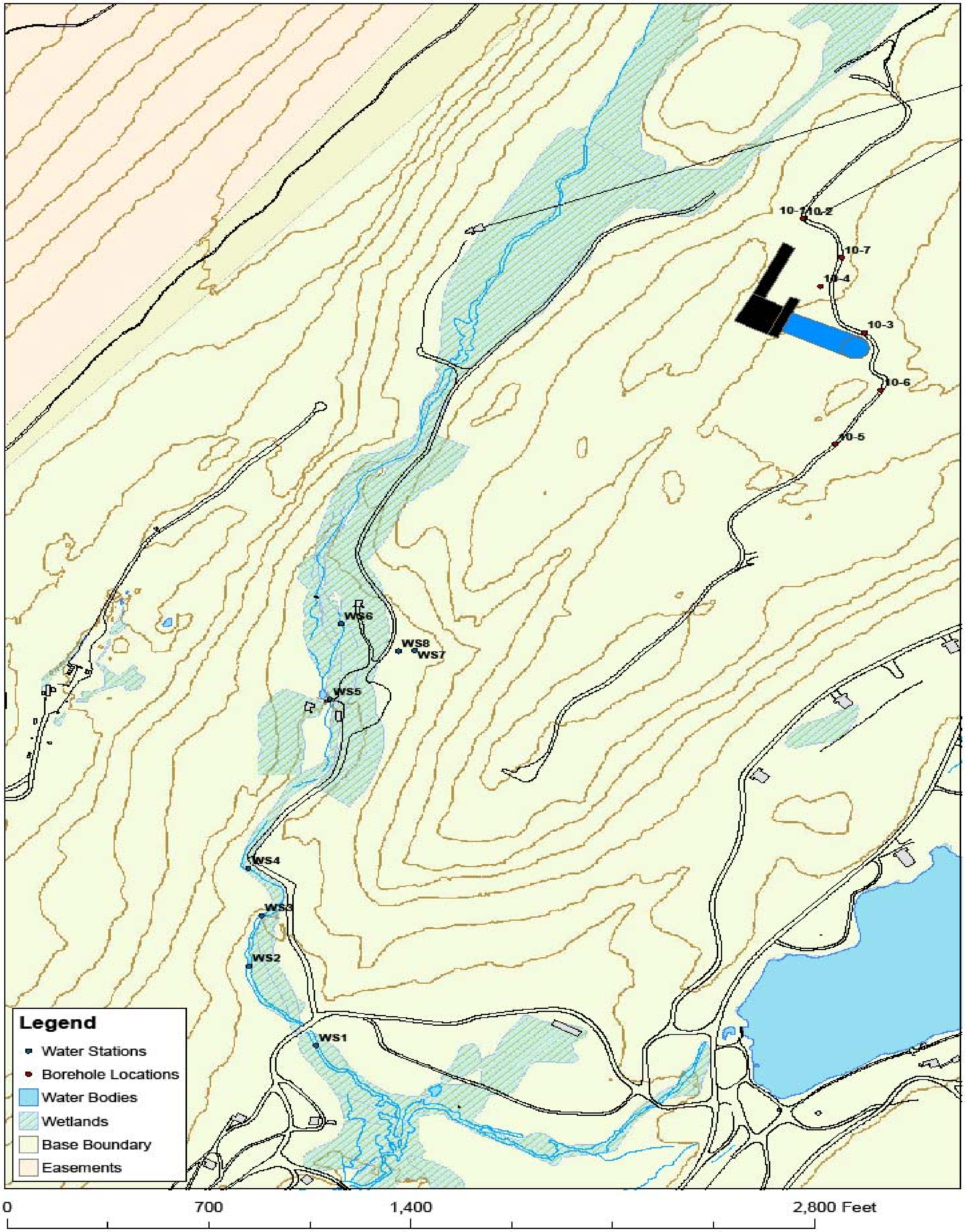


Figure A-6. Map Showing Water Sampling Stations.

Data obtained from each sample site included physical measurements from the stream using a YSI 650/600XL instrument, site specific stream habitat characteristics, and water samples to measure BOD5, COD, TKN, NO3 – low, NH3 – low, TOC, and Total Nitrogen. These data will help to establish a baseline for the stream and document chemistry for reference once the construction and operation of the SAFER chamber begins. It will also help to determine what impacts the modeling will have on the stream. Figure A-7 is a picture of Station No. 1.

Figure A-7. Station Number 1 Sampling Location.

Table A-2 is a summary of the data obtained from the Green Pond Brook inventory.

Table A-2. Chemistry and Habitat Data

GREEN POND BROOK ASSESSMENT			**Below Culverts at Gate**	**WS#1**	**WS# 2**	**WS#3**	**WS#4**	**WS#5**	**WS#6**	**WS7 Spring**	**WS8 Pond**
Sampling Date			07/22/10	07/22/10	07/22/10	07/22/10	07/22/10	07/22/10	07/22/10	07/22/10	07/22/10
Sampling Time			10:00	12:10	12:52	13:13	13:44	14:35	14:55	15:10	15:18
Air Temperature	°C			23.28	19.42	20.96	21.58	22.4	22.9	21.43	21.43
SURFACE WATER CHEMISTRY											
Height Above Brook Floor	inches		2	2	1	1	1	1	1	1	
Temperature	°C		18.68	19.18	19.64	19	19.46	20.86	19.19	12.6	20.1
Specific Conductance	mS/cm		0.068	0.068	0.073	0.062	0.06	0.058	0.057	0.026	0.033
Dissolved Oxygen	%		96	98.1	77.8	92.9	91.7	90.9	85.6	100	29.4
Dissolved Oxygen	mg/L		8.92	9.05	7.09	8.58	8.39	8.08	7.85	10.61	2.48
pH			6.65	6.55	6.57	6.55	6.63	6.45	6.09	4.84	5.42
Oxidation-Reduction Potential	mV		250	283.6	263	315	298	249	342	356	199
HABITAT ASSESSMENT SCORES		Maximum Score Possible									
Canopy Cover	%	100	90	70	NA	80	75	0	90	90	70
Epifaunal Substrate/Available Cover		20	3	5	NA	9	NA	8	13	NA	NA
Pool Substrate Characterization		20	8	11	NA	12	NA	8	13	NA	NA
Pool Variability		20	5	2	NA	4	NA	3	2	NA	NA
Sediment Deposition		20	1	8	NA	9	NA	8	7	NA	NA
Channel Flow Status		20	2	8	NA	8	NA	8	5	NA	NA
Channel Alteration		20	9	18	NA	13	NA	8	18	NA	NA
Channel Sinuosity		20	5	2	NA	3	NA	3	3	NA	NA
Bank Stability	LB	10	5	3	NA	4	NA	6	7	NA	NA
Bank Stability	RB	10	5	3	NA	4	NA	6	7	NA	NA
Vegetative Protection	LB	10	4	4	NA	3	NA	7	7	NA	NA
Vegetative Protection	RB	10	1	4	NA	3	NA	7	7	NA	NA

GREEN POND BROOK ASSESSMENT			**Below Culverts at Gate**	**WS#1**	**WS# 2**	**WS#3**	**WS#4**	**WS#5**	**WS#6**	**WS7 Spring**	**WS8 Pond**
Riparian Vegetative Zone Width	LB	10	2	4	NA	2	NA	4	4	NA	NA
Riparian Vegetative Zone Width	RB	10	2	4	NA	2	NA	4	4	NA	NA
Total Habitat Score		200	52	76	NA	73	NA	80	97	NA	NA
ANALYTICAL DATA											
Ammonia Nitrogen	mg/L		NS	0.05	NS	ND	ND	ND	NS	NS	0.12
Biochemical Oxygen Demand	mg/L		NS	ND	NS	ND	ND	ND	NS	NS	ND
Chemical Oxygen Demand	mg/L		NS	ND	NS	10	15	14	NS	NS	ND
Kjeldahl Nitrogen	mg/L		NS	0.38	NS	0.35	0.33	0.33	NS	NS	0.42
Nitrite	mg/L		NS	ND	NS	ND	ND	ND	NS	NS	ND
Nitrate	mg/L		NS	0.15	NS	0.13	0.12	0.13	NS	NS	ND
Total Organic Carbon	mg/L		NS	3.68	NS	4.28	4.81	5.32	NS	NS	2.66
Total Suspended Solids	mg/L		NS	4.4	NS	3.2	4.8	2.4	NS	NS	2.4
LB - left bank; RB - right bank; NA - not applicable/not available; ND - not detected; NS - not sampled											

ATTACHMENT 5

Aquifer Test Analysis

PumpingARDEC10-3c_Cooper-Jacob.xls

WELL ID: ARDEC 10-03

Local ID: HML-Augmentation
Date:
Time: 16:35

INPUT

Construction:	
Casing dia. (d_c)	3 Inch
Annulus dia. (d_w)	3 Inch
Screen Length (L)	175 Feet
Depths to:	
water level (DTW)	25 Feet
Top of Aquifer	25 Feet
Base of Aquifer	200 Feet
Annular Fill:	
across screen --	Open Hole
above screen --	Open Hole
Aquifer Material --	Fine-Grained Sandsto
FLOW RATE	1.7 GPM

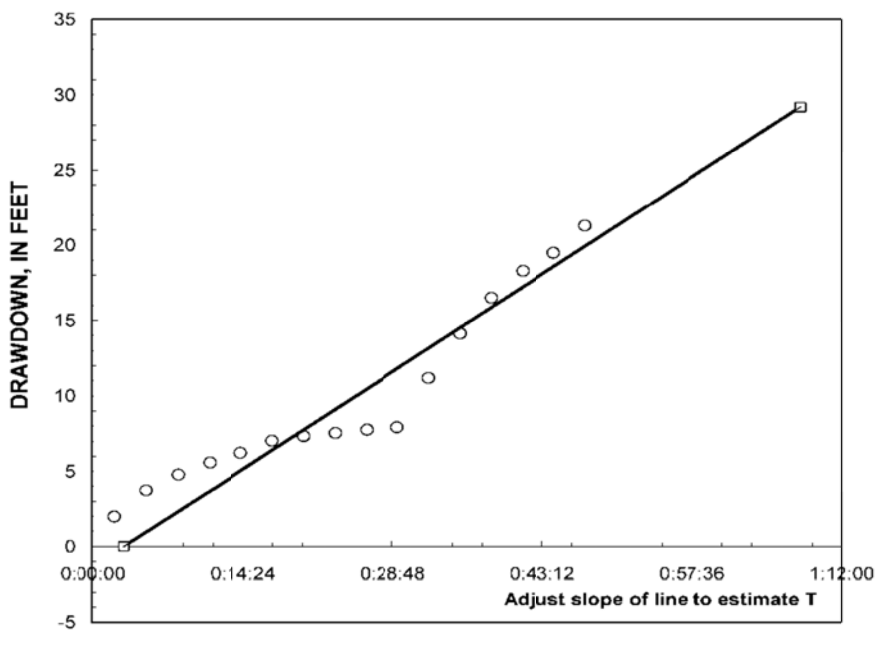
COMPUTED

Aquifer thickness = 180 Feet

Slope = 21.54365 Feet/log10

Input is consistent.

K =	0.016 Feet/Day
T =	2.8 Feet²/Day



ARDEC10-5Pumping_Cooper-Jacob.xls

WELL ID: ARDEC 10-05

Local ID: HML-Augmentation
Date: 4/19/2000
Time: 17:00

INPUT

Construction:	
Casing dia. (d_c)	3 Inch
Annulus dia. (d_w)	3 Inch
Screen Length (L)	88 Feet
Depths to:	
water level (DTW)	11.6 Feet
Top of Aquifer	11.6 Feet
Base of Aquifer	100 Feet
Annular Fill:	
across screen --	Open Hole
above screen --	Cement
Aquifer Material --	Fine-Grained Sandsto
FLOW RATE	1.7 GPM

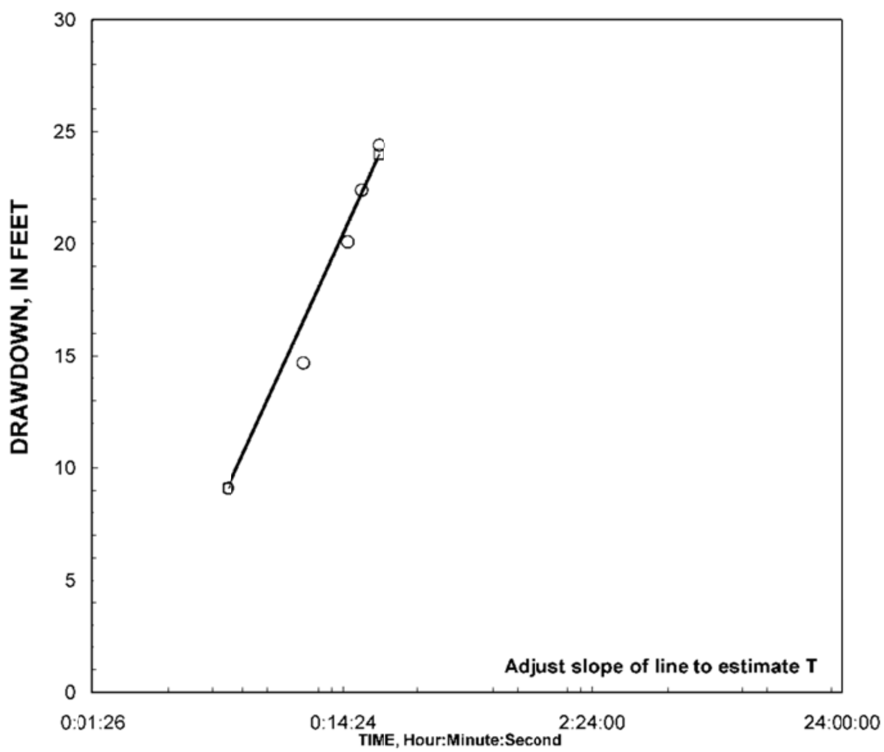
COMPUTED

Aquifer thickness = 88 Feet

Slope = 24.74836 Feet/log10

Input is consistent.

K = 0.027 Feet/Day
T = 2.4 Feet²/Day



ARDEC10-7Pumping_Cooper-Jacob.xls

WELL ID: ARDEC 10-07

Local ID: HML-Augmentation
Date:
Time: 15:32

INPUT

Construction:		
Casing dia. (d_c)	3	Inch
Annulus dia. (d_w)	3	Inch
Screen Length (L)	91	Feet
Depths to:		
water level (DTW)	9	Feet
Top of Aquifer	9	Feet
Base of Aquifer	100	Feet
Annular Fill:		
across screen -- Open Hole		
above screen -- Cement		
Aquifer Material -- Fine-Grained Sandsto		
FLOW RATE	1.7	GPM

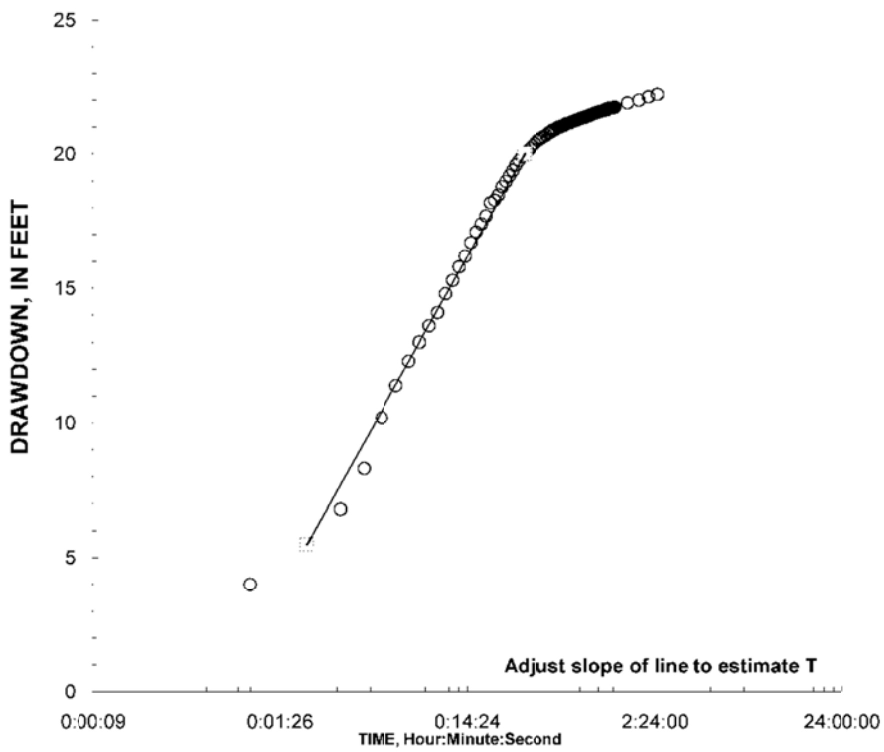
COMPUTED

Aquifer thickness = 91 Feet

Slope = 12.48528 Feet/log10

Input is consistent.

K = 0.053 Feet/Day
T = 4.8 Feet²/Day



ATTACHMENT 6

Sample SESOIL Files

Project : ChamberNitrate1

Description

Model : SESOIL

An US EPA model for long-term simulations of chemical transport and transformations in soil

Author : Your title Your name

Client : Title Key contact person

9/7/2011

1. Profile. SESOIL profile1

Model Settings

[SESOIL] Case Settings

Parameter	Value	Units
Number of Layers	2	(-)
Simulation Length	10.0	(years)
Site Latitude	41	(-)
Washload Simulation	No washload transport	(-)
Spill Type	continuous	(-)
Month to load initial concentrations	1	(-)

[SESOIL] Climate ***1 - year***

Year	Parameter	Unit	OCT	NOV	DEC	JAN	FEB	MAR
1	Mean Air Temperature	Degrees C	10.83	4.61	-1.78	-4.72	-4.17	0.56
1	Mean Monthly Cloud Cover	-	0.4	0.4	0.4	0.4	0.4	0.4
1	Mean Monthly Relative Humidity	-	0.76	0.76	0.76	0.76	0.76	0.76
1	Short Wave Albedo	-	0.2	0.2	0.3	0.3	0.3	0.3
1	Mean Monthly Evatransporation Rate	cm/day	0.0	0.0	0.0	0.0	0.0	0.0
1	Monthly Precipitation	cm	7.44	9.19	8.69	7.67	6.1	7.54
1	Mean Storm Duration	days	0.5	0.5	0.6	0.6	0.55	0.5
1	Number of Storms	-	4.0	4.5	5.0	5.0	6.0	6.0
1	Length of Rainy Season	days	30.4	30.4	30.4	30.4	30.4	30.4

(continued)

Year	Parameter	Unit	APR	MAY	JUN	JUL	AUG	SEP
1	Mean Air Temperature	Degrees C	7.44	13.39	18.89	21.5	20.5	16.72
1	Mean Monthly Cloud Cover	-	0.4	0.4	0.4	0.4	0.4	0.4
1	Mean Monthly Relative Humidity	-	0.68	0.68	0.68	0.72	0.72	0.72
1	Short Wave Albedo	-	0.2	0.2	0.2	0.2	0.2	0.2
1	Mean Monthly Evatransporation Rate	cm/day	0.0	0.0	0.0	0.0	0.0	0.0
1	Monthly Precipitation	cm	7.77	7.34	6.91	7.52	10.57	8.56
1	Mean Storm Duration	days	0.5	0.45	0.4	0.35	0.3	0.35
1	Number of Storms	-	6.0	5.5	5.0	5.0	4.5	4.5
1	Length of Rainy Season	days	30.4	30.4	30.4	30.4	30.4	30.4

[SESOIL] Contaminant Load Schedule ***1 - year***

Year	Parameter	Unit	OCT	NOV	DEC	JAN	FEB	MAR
1	[Layer1] Pollutant Load	g/sq.ft.	0	0	0	1.62	0	0
1	[Layer1] Pollutant Transformation	g/sq.ft.	0	0	0	0	0	0
1	[Layer2] Pollutant Load	μg/cm2	0	0	0	0	0	0
1	[Layer2] Pollutant Transformation	μg/cm2	0	0	0	0	0	0

(continued)

Year	Parameter	Unit	APR	MAY	JUN	JUL	AUG	SEP
1	[Layer1] Pollutant Load	g/sq.ft.	0	0	0	0	0	0
1	[Layer1] Pollutant Transformation	g/sq.ft.	0	0	0	0	0	0
1	[Layer2] Pollutant Load	μg/cm2	0	0	0	0	0	0
1	[Layer2] Pollutant Transformation	μg/cm2	0	0	0	0	0	0

2 - year

Year	Parameter	Unit	OCT	NOV	DEC	JAN	FEB	MAR

(continued)

Year	Parameter	Unit	APR	MAY	JUN	JUL	AUG	SEP

[SESOIL] Layer Parameters

Parameter	Unit	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2

[SESOIL] Initial Concentrations ***Unit :µg/ml***

Concentration	1	2	3	4	5	6	7	8	9	10
Layer 1	0.000									
Layer 2	0.000	0.000								

[SESOIL] Groundwater Settings

Parameter	Value	Units
Saturated Hydraulic Conductivity	0.05	(ft/day)
Hydraulic Gradient	.1	(-)
Thickness of Saturated Zone	10	(ft)
Width of Contaminated Zone	90	(ft)
Background Concentration	0.00000000	(mg/l)

Profile Structure

Layer	Top (ft)	Bottom (ft)	Thickness (ft)
Bedrock	0.0000	-2.1000	2.1000

1.1. Layer. Bedrock

Chemical. Nitrate

Project : FaceupAmmonia1

Description

Model : SESOIL
An US EPA model for long-term simulations of chemical transport and transformations in soil

Author : Your title Your name

Client : Title Key contact person

9/7/2011

1. Profile. SESOIL profile1

Model Settings

[SESOIL] Case Settings

Parameter	Value	Units
Number of Layers	2	(-)
Simulation Length	10.0	(years)
Site Latitude	41	(-)
Washload Simulation	No washload transport	(-)
Spill Type	continuous	(-)
Month to load initial concentrations	1	(-)

[SESOIL] Climate ***1 - year***

Year	Parameter	Unit	OCT	NOV	DEC	JAN	FEB	MAR
1	**Mean Air Temperature**	**Degrees C**	10.83	4.61	-1.78	-4.72	-4.17	0.56
1	**Mean Monthly Cloud Cover**	**-**	0.4	0.4	0.4	0.4	0.4	0.4
1	**Mean Monthly Relative Humidity**	**-**	0.76	0.76	0.76	0.76	0.76	0.76
1	**Short Wave Albedo**	**-**	0.2	0.2	0.3	0.3	0.3	0.3
1	**Mean Monthly Evatransporation Rate**	**cm/day**	0.0	0.0	0.0	0.0	0.0	0.0
1	**Monthly Precipitation**	**cm**	7.44	9.19	8.69	7.67	6.1	7.54
1	**Mean Storm Duration**	**days**	0.5	0.5	0.6	0.6	0.55	0.5
1	**Number of Storms**	**-**	4.0	4.5	5.0	5.0	6.0	6.0
1	**Length of Rainy Season**	**days**	30.4	30.4	30.4	30.4	30.4	30.4

(continued)

Year	Parameter	Unit	APR	MAY	JUN	JUL	AUG	SEP
1	**Mean Air Temperature**	**Degrees C**	7.44	13.39	18.89	21.5	20.5	16.72
1	**Mean Monthly Cloud Cover**	**-**	0.4	0.4	0.4	0.4	0.4	0.4
1	**Mean Monthly Relative Humidity**	**-**	0.68	0.68	0.68	0.72	0.72	0.72
1	**Short Wave Albedo**	**-**	0.2	0.2	0.2	0.2	0.2	0.2
1	**Mean Monthly Evatransporation Rate**	**cm/day**	0.0	0.0	0.0	0.0	0.0	0.0
1	**Monthly Precipitation**	**cm**	7.77	7.34	6.91	7.52	10.57	8.56
1	**Mean Storm Duration**	**days**	0.5	0.45	0.4	0.35	0.3	0.35
1	**Number of Storms**	**-**	6.0	5.5	5.0	5.0	4.5	4.5
1	**Length of Rainy Season**	**days**	30.4	30.4	30.4	30.4	30.4	30.4

[SESOIL] Contaminant Load Schedule ***1 - year***

Year	Parameter	Unit	OCT	NOV	DEC	JAN	FEB	MAR
1	**[Layer1] Pollutant Load**	**g/sq.ft.**	0	0	0	0.14	0	0
1	**[Layer1] Pollutant Transformation**	**g/sq.ft.**	0	0	0	0	0	0
1	**[Layer2] Pollutant Load**	**µg/cm2**	0	0	0	0	0	0
1	**[Layer2] Pollutant Transformation**	**µg/cm2**	0	0	0	0	0	0

(continued)

Year	Parameter	Unit	APR	MAY	JUN	JUL	AUG	SEP
1	**[Layer1] Pollutant Load**	**g/sq.ft.**	0	0	0	0	0	0
1	**[Layer1] Pollutant Transformation**	**g/sq.ft.**	0	0	0	0	0	0
1	**[Layer2] Pollutant Load**	**µg/cm2**	0	0	0	0	0	0
1	**[Layer2] Pollutant Transformation**	**µg/cm2**	0	0	0	0	0	0

2 - year

Year	Parameter	Unit	OCT	NOV	DEC	JAN	FEB	MAR

(continued)

Yea	Parameter	Unit	APR	MAY	JUN	JUL	AUG	SEP

r								

[SESOIL] Layer Parameters

Parameter	Unit	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2
Parameter	**Unit**	Layer1	Layer2

[SESOIL] Initial Concentrations ***Unit :µg/ml***

Concentration	1	2	3	4	5	6	7	8	9	10
Layer 1	0.000									
Layer 2	0.000	0.000								

[SESOIL] Groundwater Settings

Parameter	Value	Units
Saturated Hydraulic Conductivity	20	(ft/day)
Hydraulic Gradient	.05	(-)
Thickness of Saturated Zone	10	(ft)
Width of Contaminated Zone	150	(ft)
Background Concentration	0.00000000	(mg/l)

Profile Structure

Layer	Top (ft)	Bottom (ft)	Thickness (ft)
Fault	0.0000	-2.1000	2.1000

1.1. Layer. Fault

Chemical. Ammonium

Appendix C. Maximum Temperature Impact on Green Pond Brook

MAXIMUM TEMPERATURE IMPACT ON GREEN POND BROOK

The greatest potential for the project impacting the temperature of Green Pond Brook is associated with disruption of spring flow. Groundwater beneath the project site feeds a spring that discharges to Green Pond Brook. The maximum temperature impact due to spring flow reduction should be most pronounced in the summer when the water temperatures difference between water from Green Pond and the Upper Bedrock Aquifer is greatest. The impact can be estimated using data from the July 22, 2010, survey and flow data described previously to perform a heat balance as follows:

$$T_1F_1 + T_2F_2 = T_C(F_1+F_2)$$

where

T_1 = upstream water temperature
F1 = upstream water flow rate
T2 = spring water temperature
F2 = spring water flow rate
(F_1+F_2) = combined water flow rate
T_C = combined temperature (downstream of spring)

Before construction:

T_1 = upstream water temperature (= [(19.5*(6.6/3) – 12.6*x)/(6.6/3 – x)] °C)
F_1 = upstream water flow rate (= [6.6/3 – x] cfs)
T_2 = spring water temperature (12.6 °C)
F_2 = spring water flow rate (= x cfs)
(F_1+F_2) = combined water flow rate (= 6.6/3 cfs)
T_C = combined temperature (downstream of spring) (=19.5°C)

During construction (with maximum water diversion):

T_1 = upstream water temperature (= [(19.5*(6.6/3) – 12.6*x)/(6.6/3 – x)] °C)
F_1 = upstream water flow rate (= [6.6/3 – x] cfs)
T_2 = spring water temperature (12.6 °C)
F_2 = spring water flow rate (= x – 0.126 cfs)
(F_1+F_2) = combined water flow rate (= 6.6/3 – 0.126 cfs)
T_C = combined temperature (downstream of spring) (Calculated value: 19.92 °C)

Therefore, the maximum temperature impact on Green Pond Brook due to the project corresponds to a rise in the stream temperature of 0.42 °C (19.92 minus 19.5).

Appendix D. USFWS Letters of Concurrence

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609/383 3938
Fax: 609/646 0352
http://www.fws.gov/northeast/njfieldoffice/

In Reply Refer To:
2012-I-0114a

Mr. Richard A. Havrisko
Department of the Army
Installation Management Command
Headquarters, United States Army Garrison
Picatinny Arsenal, New Jersey 07806-5000

AUG 13 2012

Re: Response to Revised Draft Finding of No Signaificant Impact (FONSI) and Environmental Assessment (EA) for Building and Operating a Safe Armaments Facility for Energetic Research (SAFER) at Picatinny Arsenal, Morris County, New Jersey

Dear Mr. Havrisko:

On February 14, 2012 the U.S. Fish and Wildlife Service (Service) provided comments on the *Draft Environmental Assessment (EA) and Finding of No Significant Impact (F0NSI) for Building and Operating a Safe Armaments Facility for Energetic Research* (SAFER) *at Picatinny Arsenal, New Jersey*. As addressed in the comments, the Service requested Picatinny Arsenal to further assess negative impacts to the Indiana bat (*Myotis sodalis*) and its habitat and revise the EA. On April 11, 2012 Picatinny Arsenal met with Service staff to discuss conservation measures that would avoid and/or minimize impacts to the Indiana bat. Picatinny Arsenal submitted a revised EA on July 12, 2012 requesting Service concurrence. The Service reviewed the recent revisions to the EA and is providing concurrence on activities that may affect, but are not likely to adversely affect the Indiana bat.

A known Indiana bat hibernaculum is located approximately 2.7 miles from the proposed SAFER site. The latest revisions to the EA analyzed potential short-term and long-term negative impacts on the Indiana bat. Potential impacts include loss of habitat and food resources, increased noise and vibration, and decreases in air quality. To reduce impacts to the Indiana bat, the EA has agreed to prohibit construction blasting from one hour before sundown to one hour after sunrise from April 1 through November 15. Applying this conservation measure will reduce potential impacts to the Indiana bat from construction related activities. Once the SAFER is operational, noise and vibration levels would be significantly less than those during construction. The SAFER doors as described in the revised document will be sealed and prevent wildlife from entering the blasting chamber. Additionally, no significant decrease in air quality or food resources are anticipated during construction or while the SAFER is operating. The loss of approximately seven acres of forested habitat is insignificant and is in accordance with the Picatinny Arsenal Endangered Species Management Plan for the Indiana Bat. Picatinny Arsenal will remove trees after November 15 and before April 1. The Service believes construction blasting and operation of the SAFER should never reach the scale where take occurs. Therefore, we concur the construction and operation of the SAFER may affect, but is not likely to adversely affect the Indiana bat.

Other Federally Listed Species

Other than Indiana bat, no federally listed or proposed threatened or endangered flora or fauna are known to occur in the vicinity of the project site. If additional information on federally listed endangered or threatened species becomes available, this determination may be reconsidered.

Please contact Jeremy Markuson at (609) 383-3938, extensions 45, if you have any questions or require further assistance regarding federally listed threatened or endangered species.

Sincerely,

for J. Eric Davis Jr.
Field Supervisor

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609-646-9310 Fax: 609-646-0352
http://www.fws.gov/northeast/njfieldoffice

IN REPLY REFER TO:
2011-I-0128-R001

NOV 16 2011

Jonathan Van De Venter
Natural Resources Manager
U.S. Army Installation Management Command
IMCOM-PIC-PWE
Bldg 319
Picatinny Arsenal, New Jersey 07806 5000
Fax Number: (973) 724-5398

Reference: Safe Armament Facility for Energetic Research (SAFER) Project
Picatinny Arsenal, Morris County, New Jersey

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed project pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) (ESA) to ensure the protection of federally listed endangered and threatened species. The following comments do not address all Service concerns for fish and wildlife resources and do not preclude separate review and comment by the Service as afforded by other applicable environmental legislation.

A known occurrence or potential habitat for the following federally listed or candidate species is located on or near the project's impact area. However, the Service concurs that the proposed project is not likely to adversely affect federally listed or candidate species for the reasons listed below.

Species	Basis for Determination
Indiana bat (*Myotis sodalis*), endangered	November 10, 2011 letter stating that the project has been revised such that no tree clearing will occur from April 1 to November 15 of any given year. Loss of roosting and foraging habitat is insignificant and is in accordance with the Picatinny Arsenal Indiana Bat Endangered Species Management Plan.

Except for the above-mentioned species, no other federally listed or proposed threatened or endangered flora or fauna under Service jurisdiction are known to occur within the proposed project's impact area. Therefore, no further consultation pursuant to the ESA is required. If additional information on federally listed species becomes available, or if project plans change, this determination may be reconsidered.

Please refer to this office's web site at http://www.fws.gov/northeast/njfieldoffice/Endangered/ for further information including federally listed and candidate species lists, procedures for requesting ESA review, the National Bald Eagle Management Guidelines, and contacts for obtaining information from the New Jersey Natural Heritage and Endangered and Nongame Species Programs regarding State-listed and other species of concern.

Reviewing Biologist: Annette Scherer
Annette Scherer

Authorizing Supervisor:
Ron Popowski

Environmental Affairs Division 10 NOV 11

U.S. Army Installation Management Command
Headquarters, U.S. Army Garrison, Picatinny Arsenal
IMNE-PIC-PWE
Bldg 319
Picatinny Arsenal, NJ
07806-5000

Mr. J. Eric Davis Jr
927 North Main St. (Bldg D)
Pleasantville, NJ 08232

Dear Mr. Davis,

1. This letter serves to request and initiate "informal consultation" under section 7 of the Endangered Species Act for the proposed felling and removal of about 946 trees over 5 acres comprising two sites on the West and East sides of Copperas End Road. The purpose of these clearings is to create two Rock Storage sites for a previously described project known as SAFER (Safe Armament Facility for Energetic Research). To reprise, the SAFER is a major project to burrow into a hillside (Copperas Ridge) about 300 feet in order to hollow out an artificial cavern (underground chamber) in which to conduct explosive testing, while containing any/all fragments. This letter represents an addendum to that project and our initial letter dated 27 JAN 11. Whereas most of Picatinny Arsenal (PICA) lies within a 5 mile radius of known winter hibernacula for the federally endangered Indiana Bat (*Myotis sodalis*), it is understood that Army actions involving major construction or operations which significantly alter the standing forest "may affect" this forest dependent species.

2. Furthermore, and more specifically, the proposed location of these two particular action s is within 0.75 miles of an Indiana Bat capture site (1995- Upper Gorge Road). Our Integrated Natural Resources Management Plan-INRMP (and now particularly through our Endangered Species Management Component-ESMC) dictates that PICA always inform and consult with your agency on projects which may impact the forest resources within this radius (aka "zone of concern") surrounding a known capture or roosting site. The proposed construction site is 0.34 miles from the 1995 capture site and resulting zone of concern (IBAT ZoC). In 2006 a male IBAT was also captured along Upper Gorge Rd.

3. Whereas some of your staff has been on the installation in conjunction with surveys for the Indiana Bat, they should be able to reasonably assess and evaluate any potential impacts associated with this proposed project.

4. This action is being undertaken by ARDEC (Armament Research, Development, and Engineering Center) the main tenant organization at the Picatinny Arsenal Garrison. The proponent and operational organization within ARDEC is the Munitions Engineering Technology Center (METC).

   a. The title of this project is SAFE ARMAMENT FACILITY FOR ENERGETIC RESEARCH (aka SAFER).
   b. This will be a 1.8 million dollar project to create an underground testing facility for munitions, while eliminating the possibility of fragments leaving the test area.
   c. Although an Environmental Assessment (EA) for this project was expected to be finalized and available for public review in FEB 2011, only the first draft was received and reviewed by our Garrison Environmental Affairs Division this past FEB 2011. In the interim, a revised (second) draft was reviewed by our office, with comments sent back to the ARDEC proponents in late OCT 2011. A final draft EA with FNSI (Finding of No Significant Impact) has just returned to our Environmental Affairs office for final staffing. This document is expected to be available for the (NEPA) required 30-day public review by the end of NOV or first of DEC 2011.

5. Based on a recent inspection on 6 SEP 11, the two sites (known as Rock Storage Sites –RSS A & B) are characterized as follows:

   a. Total area of surface clearance is 5 acres, most of which is treed except rock outcrop rims and edges (3.5 acres at RSS-A and 1.5 acre at RSS-B).
   b. The sites to be cleared are both natural depressions (bowl-like) within the mountain top topography; each roughly "circular-oval-shaped" across from each other along Copperas End Road. These two RSS are situated on the crest of Copperas Ridge, about 0.25 miles up the Ridge from the main SAFER underground chamber site.
   c. Each site is dominated by upland Mixed Oak species (mainly Chestnut Oak) interspersed with Black Birch and a few Eastern Hemlock trees, same as the previously described SAFER site.
   d. RSS-A, on the West side of Copperas End Road ,contains approximately 780 trees that will need to be felled or bulldozed. The number of trees by size classes is as follows: less than or equal to 5inches DBH= 670 (86% of all trees to be cleared); Large/mature DBH classes= 110 (58 Chestnut Oak, 12 Black Oak, and 30 Pin Oak).
   e. RSS-B, on the East side of Copperas End Road ,contains approximately 166 trees that will need to be felled or bulldozed. The number of trees by size classes is as follows: less than or equal to 5inches DBH= 92 (55% of all trees to be cleared); Large/mature DBH classes= 74 (61 Chestnut Oak, 7 Black Oak, 3 Pin Oak, and 3 Black Birch).
   f. Nearly all of the trees were in sound condition growing well on these sites. No trees were observed that might afford summer roosting potential for the IBAT.

6. Based on the Indiana Bat ESMC and our INRMP; and on behalf of the PICA Garrison, I am requesting your concurrence of the following proposals and actions:

   a. Felling or bulldozing of all trees as necessary at these two Rock Storage sites between 1 JAN 12 (or whenever the EA has passed its 30-day public review process) and 31 MAR 12, IAW our routine tree cutting/clearing window per our ESMC plan.
   b. To reprise, and revise your previous concurrence (letter dated 2 FEB 11; 2011-I-0128) for the 2 acres of trees (1,355) at the actual SAFER construction site; that these be felled/cleared between 1 JAN 12 (anticipated start) and 31 MAR 12, since none were touched this past MAR or early APR 2011, due to the lack of a finalized EA under NEPA.
   c. Thus we are asking to be able to fell/clear all trees as necessary, over three sites, comprising now about 7 acres (ca. 2,300 trees), for this SAFER project through the period of 1 JAN 12 and 31 MAR 12; assuming that an EA with FNSI will be completed prior to JAN-MAR 2012.
   d. Despite this permanent loss of forest cover, there still exists similar and ample wooded area in the immediate vicinity and on the arsenal at large, affording summer IBAT foraging habitat.

7. I trust your agency will concur that those actions, as described and scheduled per paragraphs 1-6 above, will not adversely affect the IBAT population at our installation. Please indicate if CoA (Course of Action) 6c above is acceptable. If it is acceptable, then the caveat in your prior letter (2 FEB 11) allowing removal of certain sized trees after 31 MAR and through 15 APR 11 (if no bats were seen foraging) would become moot, and effectively rescind that letter. We are not asking for any tree removals after 31 MAR 12.

Thank you for your consideration in this matter.

Respectfully submitted,

Jonathan D. Van De Venter
Natural Resources Manager
(973) 724-4691

Appendix E. SHPO Letters of Concurrence

State of New Jersey

MAIL CODE 501-04B
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NATURAL & HISTORIC RESOURCES
HISTORIC PRESERVATION OFFICE
PO Box 420
Trenton, NJ 08625-0420
TEL. (609) 984-0176 FAX (609) 984-0578

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

August 1, 2011

Thomas Solecki
Chief
Environmental Affairs Division
Department of the Army
Installation Management Command
Headquarters, United States Army Garrison, Picatinny
Picatinny Arsenal, NJ 07806

Dear Mr. Solecki:

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR Part 800: Protection of Historic Properties, as published in the *Federal Register* on December 12, 2000 (65 FR 77725-77739) and amended on July 6, 2004 (69 FR 40544-40555), I am providing continuing Consultation Comments for the following proposed undertaking:

Morris County, Rockaway Township
Self Contained Munitions Experimentation Facility (SAFER Cave)
Picatinny Arsenal
Phase IB Cultural Resources Survey
United States Department of Defense
United States Department of the Army

The consultation comments below are in reply to the following cultural resource survey report received at the Historic Preservation Office (HPO) on July 18, 2011 for the above-referenced undertaking:

Huggan, Jason
2011 *SAFER Cave Proposed Rock Storage Locations, Phase IB Cultural Resource Survey, U.S. Army Garrison, Picatinny Arsenal, Morris County, NJ.* Prepared by the United States Department of the Army.

800.4 Identification of Historic Properties

The above-referenced report states that the archaeological survey of the three proposed rock storage areas related to the construction of a Self Contained Munitions Experimentation Facility (SAFER Cave) did not identify the existence of any archaeological deposits. Fifty-four shovel test pits (STPs) were excavated along 12 transects across Rock Storage Areas A and B. No archaeological deposits were identified along these transects. Area C was deemed to be previously disturbed based on existing landscape modification and the history of the site being covered with gravel. Due to these observations and the fact that the area will potentially only be disturbed by the placement of a rock storage pile, the area was observed to have a low potential for archaeological resources and Phase IB testing was not conducted.

Please note, the U-shaped stone feature outside the Area of Potential Effect, adjacent to Area A, may represent a possible collier's hut and has the potential to be a significant cultural resource. This feature should be noted and considered in any future undertakings that may impact the feature's location.

The report recommends that based on the results of the phase IB cultural resources survey, the proposed rock storage locations to be used as construction staging and reuses areas for the SAFER Cave will pose *No Effect* to historic archaeological properties. *The HPO concurs with your finding that there or no historic properties affected within the project's area of potential effects. Consequently, pursuant to 36 CFR 800.4(d)(1), no further Section 106 consultation is required unless additional resources are discovered during project implementation pursuant to 36 CFR 800.13.*

Additional Comments

Thank you for providing the opportunity to review and comment on the potential for the above-referenced project to affect historic properties. Please reference the HPO project number 11-0410 in any future calls, emails, or written correspondence to help expedite your review and response. Please do not hesitate to contact Vincent Maresca (609-633-2395) with questions regarding archaeology or Jonathan Kinney of my staff at (609-984-0141) with questions regarding historic architecture.

Sincerely,

/Km

Daniel D. Saunders
Deputy State Historic
Preservation Officer

Cc: Jason Huggan – US Dept. of the Army

Jason Huggan
Environmental Affairs Division
Bldg. 319
Picatinny Arsenal, NJ 07806

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, PICA'
PICATINNY ARSENAL, NEW JERSEY 07806-5000

REPLY TO
ATTENTION OF

IMCOM
SOLDIERS • FAMILIES • CIVILIANS

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DEC 3 2010
HISTORIC PRESERVATION OFFICE

November 30, 2010

11-0410-1 VM
HPO-L2010-069

Environmental Affairs Division

Daniel Saunders
Deputy State Historic Preservation Officer
State of New Jersey Historic Preservation Office
Department of Environmental Protection
Mail Code 501-04B
PO Box 420
Trenton, NJ 08625-0420

SUBJECT: Self Contained Munitions Experimentation Facility
Cultural Resource Survey and Historic Property Effect Determinations
U.S. Army Garrison, Picatinny Arsenal, Morris County, NJ

Dear Mr. Saunders,

U.S. Army Garrison, Picatinny Arsenal (USAG Picatinny) has determined the need to construct an underground testing arena within a newly (still to be) created man-made cave. This new ordnance testing arena will be known as the Self Contained Munitions Experimentation Facility (SAFER Cave) and located north of the 1222 Range within a narrow valley between Copperas Ridge and Upper Gorge Rds (enclosed maps).

To note, this project has been previously discussed with your office as part of the larger Real Property Master Plan and Facility Reduction Program Programmatic Agreement (RPMP FRP PA; Stipulation IV[A.i.-iv.]) signed May 17, 2010. However, due to the costs and allocated funding planned for the project, a redirection of funds from RPMP Military Construction directly to the customer will occur (Armament Research Development Engineering Center). As a result, this construction project will be completed via an Individual Job Order (IJO) and no longer part of the Garrison's larger RPMP. Due to this, USAG Picatinny would like to remove this project from the larger RPMP FRP PA (Attachment A) and finalize the project's Section 106 review process upon your date of receiving this consultation letter initiating this Undertaking as stated within.

The Area of Potential Effects (APE) for the project is shown within Figures 1-3. This area was defined as archaeologically sensitive within Panamerican Consultants, Inc.'s assessment of the installation from 1997-2003 (Sensitivity Area 43; Schieppati et al.:5-73, 5-76, and Figure 6.3) with further revision within USAG Picatinny's 2009-2013 Integrated Cultural Resource Management Plan (ICRMP; Huggan 2008: Figure 4.1c, 5-18 – 5-20). Sensitivity Area 43 is defined within these reports as

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> Occupies the upper elevations of Copperas Mountain [with]in the north-central part of Picatinny Arsenal. Elevation ranges from 1000 to 1200 ft (305-366 m)...situated between Green Pond Brook to the west and Burnt Meadow Brook to the east...WES [Waterways Experiment Station] (1995) and Fitch and Glover (1990) assigned a low archaeological sensitivity rating for the steep slopes and moderate ratings for the peaks and various small terraces. Field observations substantiate that the area is not disturbed. Phase IB shovel testing is recommended prior to any potential impact[s] (Schieppati et al.:5-73). ; and

may have the potential for "hunting and gathering camps or rockshelters, upper elevations of Copperas Mountain" (Huggan: 5-20, Table 5.1, cited from Cinquino et al. 1996 draft ICRMP).

Historic Research and Mapping of APE

According to USAG Picatinny's 1931 History of Picatinny Arsenal,

> an expensive wagon road leading from Denmark Pond up the north side of the stream to Green Pond was built about the year 1876 by the Denmark Land and Improvement Company [DLIC], a New York enterprise, with the vice of laying out and building lots and making improvements [later called Lidgerwood Estates and Lidgerwood Tract within other references]...and was finally abandoned, and (in 1882) all the improvements were fast assuming the original wildness of the country (Rogers: 8).

This land owned by DLIC was also portioned out to Julia Merritt on an 1886-1942 property map of the Arsenal (Figure 12).

Further research from a newspaper article within the Iron Era dated Saturday, September 3, 1887 entitled *'Lake Denmark Awakened: Opening of the new Merritt Park Hotel'* noted "Lake Denmark being 112 feet higher than Middle Forge pond on the Government Property, while Green Lake [Pond] is 174 feet higher than Denmark. Between the two latter points is *a road widening through a natural gorge, bordered with rocky palisades of wondrous beauty*" [italicized portion noted as Upper Gorge Rd] (http://rtlibrary.org/iron_era/1887/1887-09-03.pdf, pg. 3).

Later in 1943, these lands were taken over by the U.S. Army for Picatinny Arsenal through the War Powers Act (eminent domain) as a safety requirement necessity for ownership of the Lake Denmark Dam, and construction of igloo magazines (now the 1200 Area) and necessary roads. Other improvements included development along Upper Gorge Rd for the latter constructed 1240 Range (located northeast of project area), and Copperas Ridge Rd for a water tank (Structure 1243, located at the end of Copperas Ridge Rd) to service and overlook the 1222 Range (located downslope southwestwards from project area). To note, the beginning of the APE was the location for the end of the former 500 meter firing point from the 1240 Range (Photos 1 and 2). These noted structures and test ranges were built between the late 1940s and 1960s (Figure 3).

Portions of Upper Gorge Rd, and the approximate location for the APE are noted below within the following historic maps:

Figure 4- 1777, Faden, Wm, map of Province of New Jersey;

Figure 5- 1781, Lieut. I. Hills, A sketch of the northern parts of New Jersey;

Figure 6- 1853, Lightfoot, J. and Samuel Geil, Map of Morris County, New Jersey, early formation of Upper Gorge Rd identified;

Figure 7- 1867, Cook, G. and G.M. Hopkins, Group of Iron Mines in Morris County

Figure 8- 1874, Cook, G. and John C. Smock. Geological Survey of NJ

Figure 9- 1887, Beers, F.W., Atlas of Morris County, New Jersey

Figure 10- 1900, Smock, John C., Geological Survey of NJ

Figure 11- 1905, Lake Hopatcong, New Jersey Quadrangle map

Figure 12- 1918, Kummel, H. (1903, Gilkyson and Meeker and 1913, Stevens, Meeker and Kummel maps similar), Road Map of New Jersey;

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Figure 13- 1886-1942, Property Map Land Acquisition, Engineering Dept., Ordnance Dept. of the U.S. my, available at Directorate of Public Works, Real Property files;

Figures 14-18- 1931, 1957, 1963, 1970, and 1979 aerials (courtesy of Historic Aerials.com and 2010 Nationwide Environmental Title Research, LLC);

Figure 19- 1984, Picatinny Arsenal map

Figure 20- 2007 aerial with noted conditions from site visit (conducted December 2009, and June and November 2010).

As noted, the majority of the maps were researched courtesy of the Rutgers Cartography Lab, Historical Maps of New Jersey at http://mapmaker.rutgers.edu/MAPS.html. (Additionally, other maps were researched; however only those with evident portions of the noted roads and visible topographic features are enclosed below).

Site visits were made to the project area in December 2009, and again in June and November 2010. During these visits, much bedrock was observed on the surface of the project area with no identifiable archaeological sites and/or features of potential significance for the National Register of Historic Place (NRHP; Photos 3-12). Additionally, no petroglyphs or rock art were noticed within the narrow valley's rock wall slope. A small rock overhang was observed opposite of the APE on the other side of the valley rock wall (not to be disturbed), but not large enough for shelter or resource storage (Photos 13-14). A small stonewall was also observed at the very edge of the top of the slope for the tree clearance area (Photos 15-19). The immediate area surrounding the stonewall will not be cleared for trees; however, directly downslope will be (Photos 18-19). The stonewall appears to be modern and was probably built during the World War II timeframe, when the Army utilized some of the surrounding lands within the 1200 Area for troop training, and may have also been utilized more recently by hunters for siting game within the surrounding area.

Overall, the development plan for the SAFER Cave is to construct a man-made cave arena directly within a sloped area, along with an access road and loading dock for vehicles and large trucks. New utilities will be provided by generator(s) with no right-of-way excavations currently planned. Additionally, tree clearance is needed around the facility (shown in green within Figures 1-3) for safety and access purposes. Once the cave structure is constructed, the remainder of the APE (shown in hatched black lines in Figure 1, and blue in Figure 2 labeled as 'Tunnels' and 'Chamber') will be cleared for trees (stumps to remain) for ventilation and access to the roof of the structure (located underground) for excavations tying into roof cables located within the structure (for support and stabilization during ordnance operations). These excavations will be comparative to geotechnical borings in size. This latter area (shown in hatched black lines in Figure 1, and blue in Figure 2 labeled as 'Tunnels' and 'Chamber') is defined as archaeologically sensitive within the ICRMP, while the remainder of the APE contains much slope and bedrock (Photos 1-12). Considering these excavations will be minimal in size, the potential to impact significant archaeological deposits that may be eligible for the NRHP is low. Regardless of this determination, USAG Picatinny will ensure the implementation of Standard Operating Procedures (SOP) during the construction phase of this Project that if any archaeological/cultural resources are discovered, the Cultural Resources Specialist and Garrison Archaeologist, Mr. Jason Huggan, will be notified for further investigation. These SOPs were established within Stipulation IV (B and Attachment D) of the RPMP FRP PA.

In conclusion, USAG Picatinny has determined that the proposed construction of a new underground testing arena within a newly (to be) created man-made cave, known as the Self Contained Munitions Experiment Facility, *should have No Effect on Historic Properties (archaeological sites) that may be potentially significant for eligibility to the NRHP.* We request that your office provide a ***review and concurrence with this determination for this Undertaking.*** Please mail your response to the following address:

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HPO-L2010-069

Mr. Jason Huggan
Environmental Affairs Office
Bldg 319
Picatinny Arsenal, NJ 07806

If you require further information, please contact Mr. Jason Huggan at (973) 724-3664, jason.j.huggan@us.army.mil

Sincerely,

Thomas Solecki
Chief, Environmental Affairs Division

ENCLOSURES FOR OFFICIAL USE ONLY

I concur with your finding that there are no historic properties affected within the project's area of potential effects. Consequently, pursuant to 36 CFR 800.4(d)(1), no further Section 106 consultation is required unless additional resources are discovered during project implementation pursuant to 36 CFR 800.13.

12/10/10

DANIEL D. SAUNDERS
Deputy State Historic Preservation Officer — Date
NP

Cc: Betsy Merritt
National Trust for Historic Preservation

Walter Gallas
National Trust for Historic Preservation, Northeast Regional Office

Tamara Francis
Delaware Nation of Oklahoma

Dr. Brice Obermeyer
Delaware Tribe of Indians of Oklahoma

Karen Kaniatobe
Absentee-Shawnee Tribe of Oklahoma

Kim Jumper
Shawnee Tribe

Stephanie Cherry-Farmer
Preservation New Jersey

Peg Shultz
Morris County Heritage Commission

Bonnie-Lynn Hadzeika
Morris County Historical Society

Marion Harris
Mt Hope Historical Conservancy
Morris County Trust for Historic Preservation

John Dunado
Historical Society of Rockaway Township

Christine Williams
Jefferson Township Historical Society

Judy McBride
Denville Historical Society

Cecilia Thea Dunkle
Mt Olive Township Historical Society

References

Huggan, Jason J.

2008 *Integrated Cultural Resource Management Plan, Picatinny Arsenal, Rockaway and Jefferson Townships, Morris County, New Jersey: 2009-2013.* Prepared for Picatinny Arsenal by Chugach Industries, Inc., Picatinny Arsenal, New Jersey.

Iron Era

1887 Lake Denmark Awakened: Opening of the new Merritt Park Hotel. Courtesy of Rockaway Township Free Public Library, 2010, http://rtlibrary.org/historicnewspaper.html.

Rogers, J. A., Jr.

1931 *History of Picatinny Arsenal*. Picatinny Arsenal, Dover, New Jersey.

Schieppati, Frank J., Michael A. Cinquino, Robert J. Hanley, Peter J. Gorton, Mark A. Steinback, Edward V. Curtin, and Kerry Nelson

2003 An Archaeological *Field Inspection of 55 Sensitive Areas, Phase IB Archaeological Surveys of Eight Areas, and a Phase II Investigation of Three Sites at Picatinny Arsenal, Morris County, New Jersey.* Panamerican Consultants, Inc., Depew, NY. Prepared for Northern Ecological Associates, Inc., Canton, NY, under contract to U.S. Department of the Army, New York District, Corps of Engineers, New York.

Appendix F. Comparison of Demographics between Morris County and the State of New Jersey

People QuickFacts	Morris County	New Jersey
Population, 2009 estimate	488,518	8,707,739
Population estimates base (April 1) 2000	470,212	8,414,378
Persons under 5 years old, percent, 2009	5.8%	6.4%
Persons under 18 years old, percent, 2009	23.9%	23.5%
Persons 65 years old and over, percent, 2009	13.5%	13.5%
Female persons, percent, 2009	50.5%	51.0%
White persons, percent, 2009 (a)	86.6%	75.8%
Black persons, percent, 2009 (a)	3.3%	14.5%
American Indian and Alaska Native persons, percent, 2009 (a)	0.2%	0.4%
Asian persons, percent, 2009 (a)	8.7%	7.8%
Native Hawaiian and Other Pacific Islander, percent, 2009 (a)	0.1%	0.1%
Persons reporting two or more races, percent, 2009	1.2%	1.4%
Persons of Hispanic or Latino origin, percent, 2009 (b)	11.3%	16.7%
White persons not Hispanic, percent, 2009	75.9%	61.1%
High school graduates, percent of persons age 25+, 2000	90.6%	82.1%
Bachelor's degree or higher, pct of persons age 25+, 2000	44.1%	29.8%
Persons with a disability, age 5+, 2000	58,875	1,389,811
Housing units, 2009	186,410	3,526,741
Homeownership rate, 2000	76.0%	65.6%
Housing units in multi-unit structures, percent, 2000	23.5%	36.1%
Median value of owner-occupied housing units, 2000	$257,400	$170,800
Households, 2000	169,711	3,064,645
Median household income, 2008	$99,268	$70,347
Per capita money income, 1999	$36,964	$27,006
Persons below poverty level, percent, 2008	4.0%	8.7%

Source: U.S. Census Bureau, 2000

Appendix G. Public Comments and Associated Responses

The Army appreciates the many thoughtful, detailed comments we received from interested stakeholders during the public comment period. The Army takes agency, public, and other stakeholder comments very seriously; where appropriate, we have used the comments to improve or expand upon our draft analysis, and have even conducted additional surveys/studies to confirm the findings of this EA. Following are the Army's answers to public comments received on the EA/FNSI during the public comment period from January 11, 2012, through February 17, 2012.

Public Comment Response Matrix
Building and Operating a Safe Armaments Facility for Energetics Research at Picatinny Arsenal, New Jersey
December 2012

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
1	NJ Highlands Coalition	1-3	Please provide the names of persons from the 4 agencies listed on pages 1-3 who are invited to help review this EA.	Concurrence memos received from the United States Fish & Wildlife Service (USFWS) and the New Jersey State Historic Preservation Office (SHPO) are included as appendices within the EA. The Army engaged the Picatinny Directorate of Public Works, Environmental Affairs Division, as well as the New Jersey Department of Environmental Protection (NJDEP) in the initiation and planning phases of the proposed action.
2	NJ Highlands Coalition	1-3	Minimal cooperation with environmental agencies (40 CFR 1501.4(b)): Section 1.4 of the draft EA lists the efforts made at coordination with local, state and federal agencies in "obtaining information and feedback pertaining to the construction, operation and maintenance of the SAFER on Picatinny Arsenal." Besides PICA, only three offices of NJDEP are mentioned. No municipal or county level offices or interested NGOs at any level of regional interest are listed. In an email message to Mr. Rowland dated February 1, 2012, I requested the names of the agency personnel who were invited to review the draft EA. I have not received any response.	The EA is prepared in accordance with 32 CFR 651, *Environmental Analysis of Army Actions.*
3	NJDEP	2-8	"Based on review of the information contained in the EA, with the implementation of specified mitigation measures, building and operating the SAFER would have no significant effects on human health or the natural environment, and would have no significant cumulative effects on human health or the natural environment." Without a final design from PICA of the SAFER facility (as stated on pg. 2-8, "...the final design remains fluid at this time and would not be available until construction begins..."); biological data regarding rare, snakes and turtles (including two species the DoD consider "species at risk"), ENSP can not assess the potential short an long term impacts to these species and cannot support this statement.	Specific engineering design details would be provided later in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document. All State-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect State-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of State-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
4	NJ Highlands Coalition	2-10	In RSR it warns to avoid a "structural complication" in the bedding geology near the SAFER chamber site. How and when will it be known if this "complicated" bedding will be avoided? What happens if it is intersected while tunnel or chamber excavation is underway? Is there a work around alternative; or will it be like putting a picture hanging nail through the sheet rock wall rather than into a stud? If a new tunnel is made where will the extra rock debris be stored? Such scenarios are not addressed with contingency plans in the EA. If the rock structure is too "complicated" or simply insufficient for this project there is no restoration plan identified to remediate the site.	The "ARDEC Project Rock Stability Report" (CPI, 2010) or RSR was completed in November 2010 for the planning phase of this proposed action. As discussed in Section 2.3.3, the intent of the rock feasibility study is to validate the initial rock studies and data results. If the results of the studies yield that the site is unfeasible to withstand excavation and construction, ARDEC would continue to seek other location alternatives and would need to supplement this EA at a later time. The installation has developed site restoration procedures within the INRMP that would be applicable, should the SAFER project need to be abandoned and the site restored. Specifically, Sections 8.2.2, Reforestation, Section 8.12, Soil Resources and Land Rehabilitation Management, and Section 8.14.3, Landscape Restoration and Plantings of the INRMP provide guidance regarding how to property restore and revegetate the site. Further, the scope of all feasibility studies is included as part of the proposed action in this EA. Should site restoration be required, ARDEC will examine several alternative ways to restore the site, and the expected impacts of those alternatives, in accordance with NEPA and all other relevant laws, regulations, and EOs.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
5	NJ Highlands Coalition	2-10	Similar to the above anticipated rest during excavation, another scenario is indicated that defies logic. In the same RSR it states that "multi – decade stability" and "minor maintenance requirements" (both being functional operating criteria) will be determined after the chamber is built. Again, this begs the question regarding abandonment and slash for site restoration if one or both criteria are not met. Restoration scenarios need to be part of the alternatives analyses and as mitigation measures. Although PICA is renowned for its experimental expertise with explosives, it should not presume to experiment boldly with the environment.	The Army anticipates that rock feasibility study will validate the findings of the initial rock studies and data results. Should site restoration be required, ARDEC will follow the procedures referenced in the response above for any required restoration activities.
6	NJ Highlands Coalition	2-10	The entire paragraph on page 2-10 of the EA is illogical. In this one paragraph it presents two contradictory statements about feasibility studies: they are "intrusive and may have adverse impacts", yet later they are, "far less impactful". Although they are not assessed as to their impacts (presuming someone knows what they would entail on the ground – to include possible significant adverse effects) they cannot be conducted until a FNSI is signed - this is flawed reasoning. Just how intrusive are the feasibility studies? This is simply an attempt to conduct multiple intrusions in the environment with unknown severity yet expected adverse impacts without NEPA evaluation, before implementing the actual (construction) project which is believed or pre-programmed to be a FNSI. Under NEPA, all effects and their impacts must be examined, and all mitigations to reduce significance of impact must be identified and assessed, committed to and funded by the action agency in order to render a FNSI.	The scope of all feasibility studies, including action and related equipment/vehicles, is included as part of the proposed action in this EA. The feasibility studies would be less intrusive than the planned excavation and construction of the SAFER.
7	NJ Highlands Coalition	2-10	There are at least four so-called feasibility studies: rocks stress, groundwater, rock storage site characterization, and ANFO contamination potential. Considering them either individually or collectively their impacts are not described nor any BMPs or mitigations prescribed which is faulty enough; however if the overall project must be abandoned due to results confirming unfeasibility, there is still no restoration or remediation discussed.	A preliminary rock stress study has been conducted as part of the planning phase of this proposed action. Prior to excavation and construction of the chamber and adits, ARDEC will perform a rock feasibility study to confirm site stability. A hydrogeologic study was conducted in 2012, the results of which are discussed in Sections 2.3.3.1 and 3.7 of the EA. The installation has site restoration procedures within the INRMP that would be applicable, should the SAFER project need to be abandoned and the site restored. Specifically, Sections 8.2.2, Reforestation, Section 8.12, Soil Resources and Land Rehabilitation Management, and Section 8.14.3, Landscape Restoration and Plantings of the INRMP provide guidance regarding how to property restore and revegetate the site. Further, the scope of all feasibility studies is included as part of the proposed action in this EA. Should site restoration be required, ARDEC will examine several alternative ways to restore the site, and the expected impacts of those alternatives, in accordance with NEPA and all other relevant laws, regulations, and EOs.
8	NJ Highlands Coalition	2-10	Confounding this deficiency further is the fact that the timing of these feasibility studies implies that they will commence during or after site clearing and construction activities (i.e. project implementation). An EA/FNSI project may not commence unless all mitigations (and monitoring mechanisms) are in place and implemented with project progression, yet many mitigations are to be determined by or after these intrusive and adverse, but less impactful studies are performed.	A preliminary rock stress study has been conducted as part of the planning phase of this proposed action. Prior to excavation and construction of the chamber and adits, ARDEC will perform a rock feasibility study to confirm site stability. At this time, it is anticipated the rock feasibility study will validate the findings of the initial rock studies. The environmental effects of the feasibility studies are analyzed in the EA and applicable mitigations will be in effect.
9	NJ Highlands Coalition	2-10	One example of conflicting statements regarding feasibility studies from RSR and the EA: If rock stress feasibility will occur inside the completed chamber, why is it then stated it will be done "prior to excavation and construction"?	A preliminary rock stress study has been conducted as part of the planning phase of this proposed action. Prior to excavation and construction of the chamber and adits, ARDEC will perform a rock feasibility study to confirm site stability. At this time, it is anticipated the rock feasibility study will validate the findings of the initial rock studies. The environmental effects of the feasibility studies are analyzed in the EA and applicable mitigations will be in effect.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
10	NJDEP	2-10	Site Preparation: "ARDEC contracted for the below follow-on studies to further substantiate use of this location (more detail on individual studies can be found in the relative sections of the EA)…Rattlesnake survey (Section 3.8 Biological Resources)": NJDEP's ENSP agreed to conduct surveys but was not permitted access until a week after the requested date (see attached interim gestation report, Scants 2011). The access - (and therefore, survey-) delay caused the inability to sufficiently survey and complete surveys for gestation/birthing areas. No den or transient/basking area surveys have been conducted.	All NJDEP-recommended surveys for listed snakes were completed during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
11	NJDEP	2-10	Feasibility Study: "Prior to excavation and construction, ARDEC must perform a final horizontal rock stress feasibility study to confirm site stability and conduct a groundwater feasibility study." During multiple NJDEP/PICA (including ARDEC) personnel field site meetings, PICA personnel informed NJDEP that in order to determine groundwater feasibility of the site, PICA would: 1) Conduct well tests at three locations during the winter to assess groundwater feasibility. 2) If those tests results were favorable, PICA would then remove thousands of cubic feet of rock from the slope where the face of the SAFER facility entrance will occur in order to conduct a final assessment regarding rock stress and groundwater feasibility.	A preliminary rock stress study has been conducted as part of the planning phase of this proposed action. Prior to excavation and construction of the chamber and adits, ARDEC will perform a rock feasibility study to confirm site stability. At this time, it is anticipated the rock feasibility study will validate the findings of the initial rock studies. The environmental effects of the feasibility studies are analyzed in the EA and applicable mitigations will be in effect. A hydrogeologic study was conducted in 2012, the results of which are discussed in Sections 2.3.3.1 and 3.7 of the EA.
12	NJ Highlands Coalition	2-10,11,12	Explain how there are “no personnel on site during detonation testing”? How is testing performed, by remote control somehow? If so, how far away?	As stated in the EA, "No personnel are permitted to remain on site during detonation testing. The SAFER unit would be operated remotely, and munitions would be detonated from an existing control building outside the immediate area. ARDEC personnel would follow existing SOPs to ensure safe operation of the unit during munitions testing events."
13	NJ Highlands Coalition	2-10,11,12	How and when is a rock stress study to be performed? What exactly is required to do such a study?	A preliminary rock stress study has been conducted as part of the planning phase of this proposed action. Prior to excavation and construction of the chamber and adits, ARDEC will perform a rock feasibility study to confirm site stability. Specific engineering design details will be provided in the design phase.
14	NJ Highlands Coalition	2-10,11,12	When is excavation and construction scheduled to begin – time of year?	The duration of the construction phase is currently planned to be six months in total. The Army does not intend for construction to be completed within six consecutive months, and a construction start date has not been committed to as the NEPA analysis is not yet finalized. The construction start date would take into account seasonal restrictions on tree-clearing and other activities.
15	NJ Highlands Coalition	2-11	The section covering this complex project is underwhelming in its brevity, yet the actual vision appears in fits and spurts throughout the EA and in many reference documents. The presentation of this key action is inadequate since it is not comprehensive. This EA is like a jigsaw puzzle rather than a coherent rendering – bits and pieces here and there; and often not fitting.	The EA is prepared in accordance with 32 CFR 651, *Environmental Analysis of Army Actions* .

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
16	NJ Highlands Coalition	2-11	The primary objective is to contain fragments during (experimental) test detonations in some sort of enclosed space or structure. A few options are described and a preferred alternative is selected (i.e. SAFER cave – chamber). Although that is the primary construction objective and it is outlined in this section, many other construction actions are not also included in this logical section. Examples are: ancillary structures, stabilized construction entrance, water supply, control building, bench ramp, staging area ramp, parking, runoff diversion ditches, berms, infiltration wells, pervious pavements, or channels in road beds? These are all still sporadically introduced or mentioned in diverse sections or references and not fully described, therefore their locations and impacts cannot be ascertained, nor their impacts.	Specific engineering design details would be provided later in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document.
17	NJ Highlands Coalition	2-11	Many impacts of SAFER construction are inadequately identified, described, or assessed. Examples from ESC follow: The “electric cable and roadway designs are not completed”; Swales “outside the footprint of the existing roadway” are not mentioned in the EA. This also raises questions about cumulative effects analyses. What are “other considerations” mentioned page 12, section 3.4? And from EETC examples: How well will a concrete floor, of unspecified thickness, poured over a geo-membrane ,laid on top of moist bedrock, withstand repeated forces of 5lb. fragments pelting it at velocities of 5000 feet per second? The puncture or tensile strength of geo-membranes (geo-liner in EA) are not specified.	The SAFER design is not in the final design stage, therefore, the type and thickness of the concrete floor and geoliner to be used have yet to be determined. The high-strength reinforced concrete floor would require maintenance and repairs as part of the BMPs for the facility. Similarly, the properties of the geoliner are dependent on the material(s) of construction; however, the bulk of the wear would be on the concrete, and liner elongations of 250 percent prior to failure are not uncommon (see product specifications, for example, in manual available at www.cgtower.com/geoliner-manual/Geoliner%20Manual.pdf). The purpose of the ESC report is to identify potential impacts to water quality as a result of earth-disturbing activities. Permits that may be required depending on specific site designs are identified, as well as applicable erosion and sediment control and stormwater management measures that would be considered during the design. With respect to "other considerations," the EA states the following, "A surface water survey was performed on July 22, 2010, specifically to provide background data on Green Pond Brook prior to construction of the SAFER. Budgetary constraints and other considerations resulted in foregoing the quality control sampling and analyses that would normally accompany a formal survey. The results of the survey are presented in Attachment D, Field Report, in the Groundwater Modeling Report (Appendix B of the EA)."
18	NJ Highlands Coalition	2-11	Treated elsewhere in the EA or reference documents, as if they are independent of construction, are: various roads or ramps development or improvements (including paving); and the large rocks storage areas and their actual site designs (significant); all preliminary site preparation activities such as tree clearing (or grubbing). The relationships of these construction activities to various permits are not well connected in the EA.	Table 2.3.3-1 SAFER Construction Components was added to the EA. The table clearly itemizes what items are included as part of the planned construction, what items are not planned, and what is under consideration. Potential erosion and sediment control and stormwater management BMPs are also listed.
19	NJ Highlands Coalition	2-11	Also under estimated or described is the significant size and shape of the “large pit sculpted into existing rock” through “ significant excavation” at the “portals” or “staging area”! This key construction feature alters the external land formations such that a deep, nearly four-sided pit will be big enough to fit about three Burger King stores on top of one another; and it’s access road would be like the tall sound barrier walls lining route 80 the length of two football fields!	As discussed in Section 2.3.3, the chamber would be approximately 100 feet in diameter and 50 feet high. Please reference Section 2.3.3.1 of the EA for updated graphics of the site design.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
20	NJ Highlands Coalition	2-11	There are many elements related to the SAFER engineering or mining design that are missing or incomplete, or contradictory which prevents a full appreciation of which impacts may occur, especially underground. Here are some examples. In the requested EECT there are no drawings provided which had accompanied the original report? Also the construction timeline in this report is not provided. The EA suggests at least one tunnel is “driven level”, yet drawings (that are provided) and the RSR suggest this is not true. The incline or slope, as well as its direction (into or out of) the mountain is confusing between and within the documents. This has implications for contamination laden drainage either way, but which way is the question for assessing impacts.	The "Report on ARDEC Enclosed Explosive Test Chamber" (CPI, 2009) or EECT was completed in January 2009, and the RSR was prepared for the planning phase of this proposed action in November 2010. As discussed in Section 2.3.3, the intent of the rock feasibility study is to validate the initial rock studies and data results. If the results of the studies yield that the site is unfeasible to withstand excavation and construction, ARDEC would continue to seek other location alternatives and would need to supplement this EA at a later time. Specific engineering design details would be provided later in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document. Please reference Section 2.3.3.1 of the EA for updated graphics of the site design.
21	NJ Highlands Coalition	2-11	The ESC says that the SAFER chamber will have concrete walls, floor, and ceiling, yet the EA says only a concrete floor.	The ESC report, Page 2, will be corrected to state that only the floor will be concrete.
22	NJ Highlands Coalition	2-11	There are no projected start/completion dates indicated for the overall project, for the many component steps or phases for feasibility studies, planning, permit application and coordination, not to mention construction. The only time line provided (per special request) only addresses the physical construction schedule and it is six months in duration. The EA repeatedly indicates only six months. It seems evident that this project will span more than six months, perhaps up to a couple of years; however this is not formulated with any sort of charts or timetables. A FNSI needs to explicitly confirm an outline all relevant actions, especially those dependent upon specific mitigation measures and their concurrent monitoring plans. This EA is very deficient in this regard.	The duration of the construction phase is currently planned to be six months in total. The Army does not intend for construction to be completed within six consecutive months, and a construction start date was not committed to in the EA as the NEPA analysis was not final at that time. The construction start date would take into account seasonal restrictions on tree-clearing and other activities.
23	NJ Highlands Coalition	2-11	Just as critical time lines are very important, if mitigation measures based on seasonal avoidances (of wildlife or behaviors) might be employed, so too are locations of these many construction features or construction activities crucial. No locations are indicated for control building, parking for dozens of vehicles and equipment on site, etc. From the WET it is unclear where the 0.04 acre “disturbed transition area not been impacted” is located “in the vicinity of project area” which is supposedly going to be planted with four types of plants?	Please refer to Figure 2-3 for an updated graphic that depicts the location of the 0.04 acre transition area wetland. With regards to the control building, specific engineering design details would be provided later in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document.
24	NJDEP	2-11	Feasibility Study: "Phase II would allow the ARDEC to locate the most favorable rock joint spacing. The structural integrity of the rock would help establish bolt spacing requirements for how best to secure the chamber ceiling, I-beam (support structure) locations." Will this feasibility study also require rock removal at the proposed cave entrance (and ravine to be used for access)? If so, how much rock must be removed in order to conduct Phase II? Will PICA restore the landscape if, at any stage, the site is deemed unsuitable? If not, there are potential short- and long-term impacts to wildlife, in particular rare snakes and turtles (and amphibians) that frequently use the area as part of their seasonal range and/or as (a) travel corridor(s). If yes, how do they propose to restore it? What will their objectives be for the final product?	The scope of the rock feasibility study is included as part of the proposed action in this EA. Specific engineering design details regarding Phase II of the feasibility study will be provided in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." The installation has site restoration procedures within the INRMP that would be applicable, should the SAFER project need to be abandoned and the site restored. Specifically, Sections 8.2.2, Reforestation, Section 8.12, Soil Resources and Land Rehabilitation Management, and Section 8.14.3, Landscape Restoration and Plantings of the INRMP provide guidance regarding how to property restore and revegetate the site. Further, the scope of all feasibility studies is included as part of the proposed action in this EA. Should site restoration be required, ARDEC will examine several alternative ways to restore the site, and the expected impacts of those alternatives, in accordance with NEPA and all other relevant laws, regulations, and EOs.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
25	NJDEP	2-11	Feasibility Study: "A rock stress feasibility study would be conducted in two phases. Phase I requires the removal of approximately 7 acres of vegetation in total within the area of the proposed SAFER and rock storage sites to allow access for heavy equipment to conduct borehole drilling, rock cutting, and some grading."	*N/A*
26	NJDEP	2-12	"These sites would need to be cleared of trees, accounting for approximately 7 acres in total of cleared land." It was NJDEP's understanding from discussion with PICA personnel held during field that there was no need to clear-cut the area above the SAFER facility and could, with NJDEP ENSP's guidance, salvage vegetation surrounding [potential] rare snake basking habitats (for thermoregulation and cover). Clear cutting the entire area, would potentially create an unsuitable (and potentially, more dangerous) environment for the resident snakes (and turtles).	Grubbing would be minimized to the extent possible; current plans are to fell trees by chainsaw. The footprint of disturbance analyzed in the EA represents a "worst-case scenario."
27	NJDEP	2-12	"Rock storage site A (located east of Copperas Ridge Rd as depicted in Figure 2-3) forms a natural depression in the topography. Rock storage site B would follow a down-gradient slope to the west of Copperas Ridge Rd." and pg. 2-13, figure 2-3, Map of Proposed SAFER and Rock Storage Sites: Statement and figure are contradictory. Figure 2-3 illustrates that rock storage site A is west of Copperas Ridge Rd. and site B is east of it. PICA should label Copperas Ridge Rd. in this Figure since they reference it in the text so the public and NJDEP personnel unfamiliar with the area understand the configuration.	The text was modified for clarity.
28	NJ Highlands Coalition	2-13	Paragraph about rock storage sites A and B does not match Fig 2-3; clarify orientation and gradients?	The text was modified for clarity.
29	NJ Highlands Coalition	2-13	Has the IM testing program been suspended since 2008 after the local fragment incident?	Yes, open air detonation has been suspended since 2008 at the Picatinny Arsenal.
30	NJ Highlands Coalition	2-13	Why did PICA apparently take no action to support and resume IM testing with the above ground FCTS when it was approved for development in April of 2010?	Please refer to Section 2.3.2.4, Fragment Containment Test Stand (FCTS) and Table 2-1 for further information.
31	NJDEP	2-13	The figure illustrates a third rock storage area (site C). Does PICA intend to use rock storage site C? If so, it does not appear to have been addressed within references to clearing vegetation or potential environmental impacts.	The published EA does not include any references to a "Rock Storage Area / Site C" in the text or in Figure 2-3.
32	NJ Highlands Coalition	2-2	Just how close to or far away from groundwater will this chamber be located (depth) in comparison to those unselected locations that were “too close”?	Other sites that were initially being considered had groundwater as close as two feet below ground surface, placing the entire chamber below water. The current site is on a mountain side, and test boreholes and monitoring wells installed in 2010 and 2012 showed the water table to be between 9 and 40 feet below the ground surface. Moreover, the water table is subject to significant seasonal fluctuations. Elevation data collected in September 2012 indicated depths to groundwater in the same wells up to 68 feet below grade. Dewatering may still be required to allow for construction of the SAFER, but should be less extensive than would be required at the other sites considered.
33	NJ Highlands Coalition	2-3	In the pictures in Chapter 2, which tunnel is right and which one is left?	The site design graphics were replaced with more detailed graphics that became available subsequent to the publication of the January 2012 EA. The tunnel on a decline towards the chamber floor is the right and the tunnel on an incline towards the chamber roof is the left.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
34	NJ Highlands Coalition	2-3	What exactly are the significant impacts to Geology & Soils, Water Resources, and Biological Resources without the proposed mitigations – explain?	Thresholds for significant impacts are described in Table 3-1. Mitigation measures as described and committed to in the document are designed to reduce the impacts below the level of significance.
35	NJ Highlands Coalition	2-4	How much will groundwater elevations be permanently lowered ("throughout SAFER operations")?	The groundwater table will be lowered only as needed to allow for construction and operation of the SAFER. Groundwater modeling efforts assumed a minimum of two feet clearance between the bottom of the excavation and the groundwater table, which equates to roughly 82 feet below ground surface at the chamber location. The depth to groundwater fluctuates seasonally, and the need for dewatering will vary accordingly throughout the year.
36	NJ Highlands Coalition	2-5	One of the listed alternatives is deserving of a relook and more in-depth scrutiny; the Fragment Containment Test Stand (FCTS). A review of PICA EAs shows that this was not only a viable, but the preferred alternative, solution to the dilemma of enclosed detonation testing in April, 2010 – almost two years ago. It was preferred for a variety of positive reasons. It had no direct or lasting negative impacts, especially no impact on flood plains, infrastructure, or Threatened or Endangered species. In fact this assessment revealed it had long term positive impacts on natural resources, noise, safety, and water resources, and hazardous materials.	The Fragment Containment Test Stand (FCTS) was considered in the alternatives analysis but was not carried forward for analysis because it did not meet the size and sustainability requirements of the SAFER. As stated in the EA, "This facility does not meet the criterion for test chamber size or long-term sustainability. ARDEC requires a facility that could be fully utilized into the foreseeable future while the operations and maintenance of the facility remains steady. The stand-alone, fragment-controlled facility would potentially continue to degrade over time and is projected to require regular costly maintenance of the specialized interior steel reinforced concrete walls."
37	NJ Highlands Coalition	2-5	It was favorably located at a range (616) which had year round access, space, electricity, no impacts to surface water and no impacts to wetlands or riparian areas. In that same siting Table 2, the matrix revealed that range 1222 (gorge), which is the selected site for SAFER chamber, did not have year round access, due to unimproved roads, and could impact surface waters (Green Pond Brook); as well as wetlands and riparian areas. Of five possible ranges in which to locate the FCTS, the gorge was least desirable for three out of five criteria. As it is apparent now, the location of SAFER also is beyond the reach of the improved roadway and electrical supply at range 1222.	The Fragment Containment Test Stand (FCTS) was considered in the alternatives analysis but was not carried forward for analysis because it did not meet the size and sustainability requirements of the SAFER. As stated in the EA, "This facility does not meet the criterion for test chamber size or long-term sustainability. ARDEC requires a facility that could be fully utilized into the foreseeable future while the operations and maintenance of the facility remains steady. The stand-alone, fragment-controlled facility would potentially continue to degrade over time and is projected to require regular costly maintenance of the specialized interior steel reinforced concrete walls."
38	NJ Highlands Coalition	2-5	It is contradictory to now imply (on page 2 -3) that range 1222 and beyond is accessible all year round. The constraints identified in 2010 at this location are apparently the same today. Overcoming these previously identified limitations will now require more money, more construction, and more mitigations than at any other location. Why wasn't the approved FCTS ever built as originally proposed? If it was too small as now claimed, it could have been enlarged.	Please refer to Section 2.3.2.4, Fragment Containment Test Stand (FCTS) and Table 2-1 for further information.
39	NJ Highlands Coalition	2-5	The main drawback now claimed, unlike in 2010, is that it is not durable enough to sustain repeated detonations. This is a structure made of 4 foot thick reinforced concrete and armored with 4 inch thick steel plates. If it degrades too rapidly, how is natural rock and a poured concrete floor going to withstand the forces and fragments as large as 13lbs. striking it at 4300 feet per second? The floor which may crack and degraded like the FCTS will be less than 20 feet from the valley floor water table and aquifer. Groundwater contamination is a grave threat at this site, unlike for the former FCTS.	One of the considerations in selecting the SAFER site was the strength of the competent rock that is present. At this time, the detailed design (which includes additional reinforcement, strength, and stability from high-strength, reinforced concrete) has not been finalized; however, conservative specifications regarding anticipated fragments and associated velocities would be taken into account. The floor would be reinforced to avert cracking from projectile impacts. Furthermore, part of routine maintenance would include repairs to the concrete floor. Finally, the reinforced concrete and geoliner to be placed beneath the SAFER floor should serve as barriers to contaminant migration, preventing hazardous constituents from reaching groundwater.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
40	NJ Highlands Coalition	2-5	Per RSR, the RMR of 84 suggests only a “stand up time” of ten years; yet cave integrity is supposed to be “multi-decades”. There is no discussion of chamber lifespan with roof supports, or when subjected to repeated test blast forces?	The RSR was prepared for the planning phase of this proposed action in November 2010. As discussed in Section 2.3.3, the intent of the rock feasibility study is to validate the initial rock studies and data results. If the results of the studies yield that the site is unfeasible to withstand excavation and construction, ARDEC would continue to seek other location alternatives and would need to supplement this EA.
41	NJDEP	2-5	"The entrance of the proposed facility would be a pre-split face in the hillside approximately 50 feet high and 100 feet wide." This contradicts the drawings provided by PICA and the discussion during the official field site meetings between NJDEP and PICA (including ARDEC) personnel. Figure 2-7 (pg. 39, Appendix B) of this EA reveal(ed) an approximate 80 ft. face-up in total.	Specific engineering design details would be finalized later in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document. The Army does not anticipate any significant changes to the design as it is represented in the EA.
42	NJDEP	3	Pg. 3, Para 1: "The right tunnel would be driven level to allow blasted stone from the bottom portion of the circular chamber to be removed." Pg. 3, Para2: "The floors of the access entries and the chamber itself would be on a decline toward the cave entrance to provide active drainage to an outside collection basin." Pg. 2-7 (SAFER design), Para 1: "The floors of the access entries and the chamber itself would be on an incline toward the cave entrance to provide active drainage to an outside collection basin." These statements are contradictory. Will tunnel(s) be level or sloped? If sloped, include or decline toward the cave entrance? Figures provided within the EA appear to illustrate one tunnel to be level while the other is sloped; i.e., no both "access entries." "...decline toward cave entrance...": Figures A-1, A-2, A-3, A-4 (in Section 2.0 Description of the Proposed Action and Alternatives, 2.3.3.1 Preferred Alternative-Safe Armaments Facility for Energetics Research, pgs. 2-8 and 2-9_ and Figure 2-7 (pg. 39 of Appendix B) illustrate one of the tunnels level and the second tunnel declines towards the interior of the SAFER chamber, not towards the cave entrance. As drawn, water would run into the SAFER chamber and not out to a collection basin. How will the access tunnels be on an include or decline toward the cave entrance? How will excessive water be addressed if coming from within the SAFER chamber? How will PICA collect water for transport to PICA's treatment plan (facility described on pg. 2-7, 1st complete paragraph)? Pg. 2-7 (SAFER design), 1st paragraph describes the use of French drains within the SAFER chamber, however this will only be possible if the tunnels lead out to the cave entrance (i.e., not into the chamber as illustrated within the identified figures). How is water collected and treated is a concern for wildlife and fisheries as the materials tested/exploded in the cave will contaminate water that drains from the cave. If the cave collects water there will be a risk of groundwater contamination which will impact streams and wetlands fed by the groundwater and, in turn, the wildlife that inhabit or use those streams and wetlands. If it is properly drained into collection basis, then we (DEP) need to be sure that the treatment facility is sufficient to deal with the contaminants.	The cited inconsistencies were corrected. The site design graphics were replaced with more detailed graphics that became available subsequent to the publication of the January 2012 EA. The tunnel on a decline towards the chamber floor is the right and the tunnel on an incline towards the chamber roof is the left. Please see Section 2.3.3.1 for additional information regarding the site design. All water that is collected within the facility would be transported to a regulated treatment facility and would have no contact or impact on wildlife or fisheries in the area.
43	NJDEP	3	"The left-facing tunnel would serve as a ventilation shaft, and after construction would terminate in a vertical ventilating stack, equipped with filter and fan to ensure against fragments leaving the facility…" How will this design prevent harm or trapping of wildlife? (also on pg. 2-7 (SAFER design), para. 2)	The proposed ventilating stack design has been prepared utilizing a louver’s continuous insect screen with one-quarter square openings manufactured from aluminum or stainless steel materials. This screen would be attached to the back face of the louver via metal clips. The complete louver unit would be fastened to the structure face of the tunnels and perimeter and sealed with a 1/8"-1/4" bead of silicone caulk to avoid water entry. Also, this standard louver installation would be in accordance the International Building Code (IBC) regulations for the sole purpose of preventing animal and insect entry into facilities of all classifications. The louvers would be designed and mated together to cover the required opening size of the ventilation exits for the arena tunnels. This proposed design would ensure that the louver/screen system is insect-proof and would be animal-proof, eliminating any chance of harming or trapping wildlife.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
44	NJ Highlands Coalition	3-1	PICA's use of rock as "infill" is unclear. What exactly is going to happen in five years – and where are the locations? This should be a consideration of cumulative effects analysis, but it is not a consideration at all.	The proposed Rock Storage Sites (A & B) are illustrated in Figure 2-3 and described in Section 2.3.3.1. Once placed in the rock storage area, the installation does not intend to use the rock removed by blasting from the SAFER site as infill at any other location at this time. If any rock is used, removal would be in accordance with the mitigation measures.
45	NJ Highlands Coalition	3-1	Another missing construction detail is the "specific design of the rock piles" and more importantly, will they increase storm water runoff and/or contribute to groundwater contamination from ANFO residue?	The specific design of the rock storage areas has not yet been finalized. Additional characterization of the underlying soils of the proposed rock pile site will be performed prior to design. Measures to control storm water are being addressed as part of the erosion and sediment control plan and stormwater analysis currently underway.
46	NJ Highlands Coalition	3-1	What are the road building needs and the affected resources between the SAFER site and the rock storage areas?	There are no plans to pave the road connecting the SAFER site and the rock storage areas. The road is currently graded and maintained.
47	NJ Highlands Coalition	3-1	Per the ESC how much truckloads of "rip rap" will be needed around each rock storage area? Where will it come from –ANFO contaminated rock? When will any of these massive and hugely weight bearing trucks travel up the gorge roads?	The volume of rock that will be required to build the perimeter berm around the rock storage areas will be calculated as part of the final design. The source of the rip rap has not been confirmed; however, it is not planned to be the excavated rock. Within Section 3.3, Traffic & Transportation, Table 3-4 provides the specifications of construction equipment.
48	NJ Highlands Coalition	3-1	In the former EA for the FCTS, a noted concern with the previously considered alternative was that munitions contaminants might get onto or into the ground outside that structure – which was located in an upland setting. This chamber will be in the mountain, below the mountain and very close to the water table (10 - 15 feet above the saturated ground water aquifer). This has significant potential to pollute groundwater so crucial in the Highlands region!	The concern regarding potential groundwater contamination is noted; The issue of potential groundwater contamination has been assessed and the results are reported in Appendix B of the EA. Appropriate mitigation measures are included in the EA to ensure there will be no significant impact to groundwater or Green Pond Brook.
49	NJ Highlands Coalition	3-1	Per EETC, if the floors of the access entries and chamber provide "passive drainage to the outside", what sort of contaminants will be leaking from this facility and in what quantities?	The EETC was prepared for the planning phase of this proposed action in January 2009. "Passive drainage to the outside" is no longer planned for this facility. Collection of all water from within the chamber, transfer to an external holding tank or sump, and subsequent transport to a regulated treatment facility are planned. No "leakage of contaminants" (i.e., energetic materials being tested) would occur.
50	NJ Highlands Coalition	3-1	There is mention of using infiltration wells or rinsing of rock debris as mitigation for ANFO residue; however these mitigation measures are not explicitly described or discussed, nor are they actually listed as "proposed" mitigations.	Clarification: There is mention of infiltration controls not infiltration wells. Please refer to Table FNSI-2 and Table 5-2 for the list of proposed mitigations.
51	NJ Highlands Coalition	3-1	What sort of munitions will be disposed of inside the chamber? The EA states the chambers will be used for testing, but the WET anticipates disposal also.	The Army does not anticipate disposal of munitions to occur within the SAFER.
52	NJ Highlands Coalition	3-1	P 91 of WET states references a description of actions and effects that are not discussed in the EA, and which seem important. For instance, the big "decrease in surface run off" with corresponding "increase in groundwater recharge" near the pit area is not explained in the EA. If a lot of water is going to run off and collect in the highly "fractured and extremely permeable" strata near the SAFER entrance, runoff could infiltrate into or beneath the tunnels and leak into or around the chamber.	The decrease in surface runoff and corresponding increase in groundwater cited are discussed in terms of variability in water reaching Green Pond Brook in Section 3.7.2.2, Surface Water, and Appendices B and C. The "highly 'fractured and extremely permeable' strata" cited is a section of the fault area where the generally horizontal groundwater flow is intercepted and subsequently discharged at the spring. Potential discharges of groundwater and stormwater into the SAFER chamber were quantified in the 2012 Hydrogeologic Study and will be addressed through dewatering, as needed, upgradient of the excavation and/or the constructed detonation chamber.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
53	NJ Highlands Coalition	3-1	What are "Other Species of Concern" within (Picatinny Arsenal and) "immediate surrounding area"?	Table 3.9.1.3 lists all species of concern within the project limits as compiled by the NJ National Heritage Program.
54	NJ Highlands Coalition	3-1	What (or who) defines "high quality natural areas or sensitive sites"? Besides plants, is "local extirpation of rare or sensitive animal species" a significant impact?	"High quality natural area" is a land use planning term often used to describe an area that might sustain a sensitive species. Usually, the State Department of Environmental Protection or the installation natural resource planner defines these areas. Local extirpation of, or population-level impacts on, any rare or sensitive species would be considered a significant impact, but such impacts are not anticipated as part of the proposed action.
55	NJDEP	3-1	"The significance (or severity) of potential direct, indirect, and cumulative effects is determined by evaluating the action, alternatives, and proposed mitigation measures as it relates to each individual resource area. The evaluation of significance is typically based on the assumption that the full effect of the proposed condition would occur all at once to illustrate a "worst case scenario." In actuality, the actions evaluated in this analysis would occur incrementally; therefore, the effects would be less than the maximum predicted." Actions occurring "incrementally" do not necessarily diminish the impacts of the construction and/or long-term operation of the SAFER facility to wildlife. Additionally, seasonal timing of various construction activities could prove more detrimental (or beneficial) to wildlife. For example, clearing trees in the winter minimizes harm to many rare species. However clean up of the debris should also be completed during the winter (Nov 1- March 31) to prevent the inadvertent killing of animals (reptiles, amphibians, small mammals) that, during their active season, would likely use the debris piles for shelter or foraging. Debris piles that remain may be run over, removed, or have rock piles created upon them, killing the animal(s) within.	To prevent injury or mortality associated with debris piles, the following mitigation has been included in the EA: "Any felled trees and brush will either be promptly removed and hauled away, or piled in areas away from construction activities/rock storage areas and allowed to remain undisturbed in perpetuity."
56	NJ Highlands Coalition	3-5	How large is the paved parking area near the entrance?	Specific engineering design details would be finalized in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document. The Army does not anticipate any significant changes to the design as it is represented in this EA.
57	NJ Highlands Coalition	3-5	What sort of utilities will be installed?	As cited in Section 3.2 (Land Use & Utilities), "Power would be supplied to the facility by an on-site generator prior to installation of LAN and power lines. Utilities would be installed at the proposed SAFER location following its construction..."

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
58	NJDEP	3-5	"Since the test facility is proposed for construction within a hillside, the footprint of the planned facility to be surfaced would be minimized to only a parking area adjacent to the facility's entrance." [sic] This statement seems to apply to only the testing facility and not the other improvements required for construction and post construction access. However, while the impervious cover may be limited to the test facility, other improvements that were discussed during multiple meetings between NJDEP and PICA (including ARDEC) personnel, NJDEP will have impacts to reptiles, amphibians and small mammals. NJDEP was informed (and shown plans and on site) where the SAFER facility includes, in addition to the parking area, an approximate 300' [to be cleared and paved] driveway through a ravine from the facility's entrance (i.e., driveway entrance) to the SAFER facility's cave entrance. There will also be a cleared and paved 100ft2 "staging area" at the cave entrance. This information has been omitted from this EA. In addition, while the rock storage areas will not be paved, they will be (according to this EA) cleared of vegetation and used as storage areas for excavated rock. Per PICA's proposed mitigation measures regarding rare snakes, these rock storage areas will become a part of PICA's operational activities as they intent to remove rock during the reptiles' (and amphibians' and small-footed bats') active period potentially harming any individuals that take refuge among the rocks. Since PICA will not create habitat for long-term use by wildlife (i.e., allow the rock piles to remain untouched during the species' active period), the rock piles should also be considered as part of the "footprint" for the construction of the SAFER facility and long-term operation of the Arsenal. Lastly, it is unclear if PICA intends to pave the road leading to the facility (as commented previously); if so, it should be included as part of the footprint. Whether it is paved or not will not negate the fact that the road will have increased traffic (as the area was rarely accessed prior to proposing SAFER per PICA (including ARDEC) personnel)) and therefore, an increased risk of road mortality (or injuries) to traveling reptiles, amphibians and small mammals. If the road is paved, there is increased risk of runoff into neighboring wetland(s).	The EA analyzes the total possible disturbance and no proposed areas have been eliminated from the footprint analysis. Specific engineering design details would be finalized in the design phase. Mitigations have been added to address concerns regarding listed snakes. Refer to Table FNSI-2 or Table 5-2 of the EA.
59	NJ Highlands Coalition	3-8	When are the daily trips by several concrete trucks to be scheduled through the gorge?	Concrete trucks would operate during normal business hours once the construction phase is initiated.
60	NJ Highlands Coalition	3-8	Will the unpaved road support 30-ton trucks for 96 trips per day without repeated road repairs or construction?	Road repair and maintenance would be conducted as required, the road is currently graded and maintained.
61	NJ Highlands Coalition	3-8	If rock hauling may require "more than 61 days", why does it take less truck trips?	The excavation involves movement of approximately 82,000 cubic yards of rock. The estimated number of trips is based on the volume of rock to be moved divided by the volume of the truck: 82,000 cubic yards / 14 cubic yards per truck trip equals 5,858 truck trips. The maximum amount of rock that can be moved in a day assumes that six trucks are working and can be loaded every 5 minutes. This equals 96 round trips per day. 5,858 truck trips divided by 96 truck trips per day equals 61 days. This is the minimum amount of time necessary to move the excavated rock. It would take more than 61 days if the contractor uses less than six trucks, the excavation cannot generate 1,350 cubic yards per day or there are mechanical problems with equipment involved with the excavation or with the trucks. It is not unreasonable to expect it would take more than 61 working days to move the rock, but it would take approximately 5,858 truck trips.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
62	NJDEP	3-9	EA claims "minor impacts." Although wildlife is addressed in other sections, by stating the environmental consequences will include "minor impacts" minimizes the potential affects of this project. In this section, it ignores the potential impacts of increased traffic (both during construction and the long-term operation of SAFER) to snakes, turtles, amphibians and small mammals; rare and common species. An increase in traffic may potentially increase the risk of road mortality of and/or fatal injuries to small, traveling wildlife.	Potential impacts to wildlife from increased traffic are addressed in Section 3.9.2.
63	NJDEP	3-14 - 3-15	EA claims "minor impacts." Although wildlife is addressed in other sections, by stating the environmental consequences will include "minor impacts" minimizes the potential affects of this project. In this case, it does not address the lack of information regarding how vibrations (both during construction and long-term operation of SAFER) might impact rare snakes, with special concern for snakes hibernating within the area.	Discussion regarding environmental consequences to listed snakes has been updated based on results of snake surveys conducted during 2011 and 2012.
64	NJDEP	3-2	Significant Effects Thresholds, Biological Resources-Wildlife, Threatened and Endangered Species and Other Species of Concern, Vegetation, para. 3: "The degree to which the action causes population-level impacts (e.g., potential to reduce local populations below self-sustaining levels, or long-term loss or impairment of substantial portions of local habitat would cause a significant impact." [sic] PICA acknowledges that impacts to populations would be considered "significant." The potential impacts and the appropriate mitigation would be dependent on sufficient survey data to determine the potential impacts to resident Timber Rattlesnakes, Northern Copperheads, Wood Turtles and Eastern Box Turtles.	All State-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect State-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain State-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of State-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012.
65	NJ Highlands Coalition	3-20	If BMPs are not required, will they be implemented in this project?	Whenever possible, and if deemed appropriate as dictated by project conditions, BMPs would be used. A BMP is defined by 40 CFR 130 as a practice, or combination of practices, that have been determined to be most effective and practicable in preventing or reducing the amount of pollution generated by diffuse sources to a level compatible with water quality goals.
66	NJDEP	3-23	The EA states, "Prior to excavation and construction, ARDEC must perform a final horizontal rock stress feasibility study to confirm site stability and conduct a groundwater feasibility study. A rock stress feasibility study would be conducted in two phases. Phase I requires the removal of approximately 7 acres of vegetation in total within the area of the proposed SAFER and rock storage sites to allow access for heavy equipment to conduct borehole drilling, rock cutting, and some grading. Please clarify if the air emissions associated with the Phase I work are included in the General Conformity Applicability Analysis and Table 3.4.2.2-1 SAFER Project Emissions Summary? If not, the air emissions from the Phase I work should be included in the General Conformity Applicability Analysis and Table 3.4.2.2-1 SAFER Project Emissions Summary.	Table Appendix A-8 includes emission estimates from equipment used for land clearing activity based on new information obtained on the site work.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
67	NJDEP	3-23	The EA states, "ANFO would be transported to the excavation site... A minimum amount of ANFO would be used for this study, whereas a greater amount of ANFO would be used for SAFER excavation, if the feasibility study yields favorable results." Please clarify if the air emissions associated with the transportation of the ANFO to the excavation site for the feasibility study are included in the General Conformity Applicability Analysis and Table 3.4.2.2-1 SAFER Project Emissions Summary') If not, the air emissions associated with the transportation of the ANFO to the excavation site should be included in the General Conformity Applicability Analysis and Table 3.4.2.2-1 SAFER Project Emissions Summary.	The estimates include emissions from activities associated with transporting ANFO to the site for SAFER chamber excavation. Limited information on the vehicle requirements for the feasibility study were available at the time the EA was prepared. The emissions from vehicles used to transport ANFO and emissions from excavation have been increased by 5% to account for the feasibility studies.
68	NJDEP	3-23	The EA states, "When the SAFER cave is fully excavated, additional equipment and skilled workers would be transported to the site to emplace a geo-liner beneath the floor of the SAFER main test chamber, to pour and mold concrete and to install operating equipment and blast doors." Please clarify if the air emissions from the additional equipment and workers needed to emplace a geo-liner, pour concrete and install operating equipment and blast doors are included in the General Conformity Applicability Analysis and Table 3.4.2.2-1 SAFER Project Emissions Summary? If not, the air emissions from these activities should be included in the General Conformity Applicability Analysis and Table 3.4.2.2-1 SAFER Project Emissions Summary.	Table Appendix A-8 includes emission estimates from equipment used for land clearing activity based on new information obtained on the site work.
69	NJDEP	3-23	The EA states, "Mitigation measures arc not required, since the Proposed Action is not expected to have significant adverse effects. BMP's would be implemented to minimize generation of fugitive dust and gaseous air pollutants. These BMPs may include, but are not limited to, keeping haul roads watered down and turning of the equipment when not is use." Diesel exhaust contributes the highest cancer risk of all air toxics in New Jersey. State and Federal regulations require that the project complies with (a) and (b) listed below. In addition, the Department recommends that construction projects involving non road diesel construction equipment operating in a small geographic area over an extended period of time should implement measures (c) through (I) to minimize the impact of diesel exhaust. a. All on road vehicles and non-road construction equipment operating at, or visiting, the construction site shall comply with the three minute idling limit, pursuant to N.J.A.C. 7:27 14 and N.J.A.C. 7:27 15. b. All diesel non road construction equipment operating at the construction site shall use ultra low sulfur diesel fuel (15 ppm sulfur) in accordance with the federal Nonroad Diesel Rule, 40 CFR Parts 9, 69, 80, 86, 89,94, 1039, 1051, 1065, 1068. c. All non road diesel construction equipment greater than 100 horsepower used on the project for more than ten days shall have engines that meet the USEPA Tier 4 non road emission standards, or the best available emission control technology that is technologically feasible for that application and is verified by the USEPA or the CARB as a diesel emission control strategy for reducing particulate matter emissions, except that: 1. The (agency in charge of contract or permittee) may deem as compliant any diesel retrofit technology installed by an owner or operator of diesel powered equipment prior to the effective date of this project, contract or permit. 2. If there is no technologically feasible emission control technology verified by USEPA or CARB for specific diesel non road construction equipment, the contractor may use the best available emission control technology verified by the Mine Safety and Health Administration or the Switzerland BUWAL program (VERT Filter List) to reduce particulate matter emissions. d. (The contracting agency or permittee) could send biannual reports to NJDEP, Diesel Risk Reduction Program, PO Box 418, Trenton, N.J. 08625 0418. The bi annual reports could include summaries of the equipment retrofitted, the types of retrofit devices used, any problems encountered with installation or operation of the devices, estimate of emissions reduced, and results of field audits or testing done to ensure compliance with these diesel emission reduction requirements. The reporting could be done using forms on www.stopthesoot.org. e. All on road diesel vehicles used to haul materials or traveling to and from the construction site shall use designated truck routes that are designed to minimize impacts on residential areas and sensitive receptors such as hospitals, schools, daycare facilities, senior citizen housing, and convalescent facilities. f. The contracting agency or permittee shall enforce these requirements.	Changes were made to Section 3-5 of the EA to incorporate and address the State and Federal regulations as well as other requirements noted by this comment.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
70	NJDEP	3-23	The EA includes Table 3.4.2.2-1 SAFER Project Emissions Summary. This Table includes the emissions associated with the project construction. Table 3.4.2.2-1 SAFER Project Emissions Summary does not include PM2.5 emissions for Construction Equipment (off-road and non-road) and Construction Vehicles (off-site/of-site). The Federal General Conformity regulation requires that PM2.5 and its precursors should be included in the General Conformity Applicability Analysis. Please include the PM2.5 emissions for the Construction Equipment and Construction Vehicle activities listed in Table 3.4.2.2-1 SAFER Project Emissions Summary.	PM2.5 emissions for construction equipment and construction vehicles were added to the emissions summary table.
71	NJDEP	3-26 - 3-27	EA claims "minor impacts." Although wildlife is addressed in other sections, by stating the environmental consequences will include "minor impacts" minimizes the potential affects of this project. It does not address the potential short- and long-term impacts to wildlife from an altered landscape (e.g., replacing rock slopes with vertical concrete walls, removing vegetative cover, etc.) and how the alteration to the landscape could 1) impact travel corridors and/or cause disorientation, 2) increase predation/scavenging on small animals as their vegetative cover is removed, 3) destroy critical habitats necessary for species' life history requirements and 4) potentially harm or destroy local rare snake populations due to a lack of data regarding critical habitats in need of protection (dens, gestation and birthing areas and transient/basking habitat associated with dens). In addition, the EA does not describe how PICA intends to remove trees (e.g., manually saw and fell or bulldoze); removing trees using a bulldozer will disturb soils and potentially, any wildlife (e.g., amphibians) within.	Picatinny has a policy in place to "protect and conserve state-listed wildlife within the Arsenal boundary using Best Management Practices." Accordingly, tree removal would occur by chainsaw to limit impact on surrounding area. Additionally, all NJDEP-recommended surveys for listed snakes were completed during April through August 2012. Results and mitigations developed based on those results have been incorporated into the EA. Based on the new information and analysis, Picatinny Arsenal maintains that, with the implementation of the proposed mitigations, impacts to listed snakes are likely to be minor to moderate.
72	NJ Highlands Coalition	3-27	Who determines mitigation measures for any dewatering – construction or dewatering contractor, or Picatinny decision maker(s)?	The Picatinny decision maker determines mitigation measures for any dewatering or construction activities.
73	NJ Highlands Coalition	3-27	How is a possible permanent dewatering plan and/or permit to “maintain lower groundwater elevations” NOT an ‘anticipated impact to groundwater’?	The impact that is of greatest concern is related to water quality rather than groundwater table elevation at the SAFER site. Any dewatering performed to allow for construction and operation of the facility would only impact the area between the extraction wells and the SAFER site. This mitigation measure, if implemented, would achieve the greater objectives of preventing groundwater degradation and measureable impacts on Green Pond Brook.
74	NJDEP	3-27	Throughout the EA, PICA discusses the possible need for dewatering but does not address how dewatering would impact the brook trout stream (Green Pond Brook) nor how PICA would address those potential impacts. It only defers future mitigation measure development to the contractor. It isn't until pg. 3-37 of the EA that the reader learns a "supplemental NEPA analysis would be performed to assess the impact of this change in project conditions." The EA should provide information regarding the potential need for future NEPA analysis if dewatering is necessary when references to "dewatering" first appear in the document to be more transparent regarding the potential "stages" of this project. Even with the potential need for future NEPA analysis, the EA should provide more information with regard to the potential impacts and mitigation measures needed if dewatering is necessary so the readers can better understand the potential cumulative impacts of the project rather than segmenting the impacts within stages of the process. This would provide the public and NJDEP with a better understanding of the potential cumulative impacts of this project.	From the preliminary analyses performed in the EA (e.g., Section 3.7.2.2, Surface Water, and Appendices B and C), it appears that the SAFER site groundwater is a relatively small fraction of the total groundwater flow in the fault and that rerouting or removing that flow would have immeasurably small impact on Green Pond Brook. Moreover, given seasonal fluctuations in the water table elevation (as discussed in Section 3.7.1 of the EA), it may be possible to time SAFER construction to minimize the need for dewatering. Nevertheless, Section 3.7.2.3 of the EA includes a discussion of the expected impact of dewatering operations on flow and temperature in Green Pond Brook, and the associated impacts on brook trout.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
75	NJ Highlands Coalition	3-29	If groundwater presents a problem requiring a dewatering permit and/or other mitigation measures, will other construction work be halted/suspended while such details are being figured out?	Yes, progress would be halted if monitoring results indicate any unacceptable impact to groundwater or surface water quality.
76	NJ Highlands Coalition	3-30	What is the basis or assurance that geo-liner and concrete floor will "preclude" groundwater contamination during operation, especially if design is not yet finalized? This is a significant risk that must be evaluated very carefully!	Mass transport through concrete is typically very low and diffusion controlled, with the bulk of the mass transport occurring in fine cracks. The porosity (and strength) of concrete is dependent on the water/cement ratio at the time of the pouring of the concrete. A geoliner would be laid beneath the concrete floor as an added protection to prevent any moisture and contamination that may traverse through the cracks in the concrete floor from migrating to the groundwater table. Typically, geoliner manufacturers report that their products are impermeable to water (i.e., a hydraulic conductivity of zero). Geoliners can be effective barriers to transport of moisture and contaminants to groundwater, as is the case in hazardous waste landfills, for example. Although there may be changes to the design to accommodate site conditions, the Army does not anticipate that the final design of the SAFER will be significantly different from what has been analyzed in the EA.
77	NJ Highlands Coalition	3-31	There is no "Attachment D" in Appendix B.	There was an error in the document: "Attachment D, Field Report" should have been "Attachment 4, Field Report." Text has been modified.
78	NJDEP	3-36	"…if water were encountered, the potential impact of the project on temperature would depend upon the quantity of groundwater diverted from its normal path, the temperature of water that is removed from the ground…and if it is returned to the ground, its temperature and location of reinjection...estimate the maximum potential temperature impact on Green Pond Brook due to the construction of the SAFER...so that the calculated value of the maximum potential temperature impact during construction also represents the maximum potential impact associated with the operation of the SAFER should dewatering be required, assuming that all of the dewatering operation discharge is diverted away from Green Pond Brook." "...assuming that all of the dewatering...": PICA should make it a directive that all of the dewatering discharge must be diverted away from Green Pond Brook.	The maximum potential thermal impact of diverting water from Green Pond Brook was assessed in Appendix C of the EA, and it appears that it would be less than the normal fluctuations already experienced by Green Pond Brook. Similarly, the short-term seasonal fluctuations in flow in Green Pond Brook appear to be far greater than the flow of water that would potentially be diverted from the stream. As for the issue of potential reinjection of diverted groundwater, the issue will be assessed by the construction/dewatering contractor as part of the dewatering plan to be developed prior to construction. The assessment would include recommendations regarding the disposition of any uncontaminated groundwater removed upgradient of the SAFER.
79	NJDEP	3-40	Rock Storage Areas (Minor Impact with Proposed Mitigations): Section only addresses the rock storage areas with regard to water impacts. However, the rock storage sites will impact wildlife and should be addressed accordingly. Please see detailed comments pertaining to Section 3.8 Biological Resources...Timber Rattlesnakes	Discussion of impacts to biological resources is provided in Section 3.9.2 of the EA. Mitigations related to the rock storage areas are included in Table FNSI-2 and Table 5-2 of the EA.
80	NJ Highlands Coalition	3-40	How are all these unknown variables being effectively and adequately analyzed to conclude a FNSI? So many uncertainties depending on "could be", "might be", "perhaps", "if necessary", "possible" all are grounds for developing an EIS.	The Army believes that this EA contains the best possible analysis of the environmental impacts of the proposed action that is possible before actual construction would begin. As explained in Section 2.3.3.1, there is some uncertainty in the actual design of the SAFER facility that will necessarily exist until excavation and construction begin; however, the Army believes that this EA analyzes environmental impacts sufficiently to know that there are no unmitigable, significant impacts from the proposed action. An EIS would add no substantive analysis and is not required under CEQ and Army NEPA regulations.
81	NJ Highlands Coalition	3-41	In the EA it is not clear which wetlands are being impacted or how.	Please see Section 3.8 of the EA for the wetlands discussion.
82	NJ Highlands Coalition	3-41	Apparently NJDEP is considering downgrading this wetland to an intermediate resource value because it is small, but it may nonetheless contribute to surrounding wetlands of exceptional resource value and provide seasonal breeding habitat for local amphibians.	A transition area waiver was applied for the SAFER site and is administratively complete. Although proposed in the transition area waiver, Picatinny will not pursue the lowering of the exceptional resource value wetland (0.04 acres in total). Picatinny will work with the NJDEP to execute the requirements specific to this permit.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
83	NJ Highlands Coalition	3-41	There appears to be no decision as to whether or not the road up the mountain which passes this small wetland will be paved or not. That should be addressed in this pending or some future permit –but at present it seems uncertain; therefore mitigation measures should be identified for this possible impact.	A transition area waiver was applied for the SAFER site and is administratively complete. The final design of the roadway paving has not been developed, nor has it been finalized that paving would be performed. Paving operations would be limited to the existing roadway. The unpaved road is graded and maintained.
84	NJ Highlands Coalition	3-41	The “increased groundwater recharge” effect at the pit area may cause a downhill effect at “the spring” near Green Pond Brook, causing it to gush or flow more forcefully which could alter that micro habitat.	The potential incremental flow is associated with pre-construction runoff that would be redirected to the fault. A large portion of the runoff flow that reaches "the pit area" would normally infiltrate into the ground and feed the fault system and spring anyway. Furthermore, because the fault is located on the "downhill side" of the SAFER site and a hill is located between the site and Green Pond Brook, much of the runoff is also normally directed into the fault area where it infiltrates and increases the groundwater flow. Finally, since the extent of the fault is substantial, and the contribution to groundwater flow from the SAFER site is relatively small, it is not likely that the "increased groundwater recharge" would contribute to a substantial change in the groundwater flow in the fault system that emerges at the spring. In other words, the impact is expected to be small, and no "gushes" are expected at the spring.
85	NJ Highlands Coalition	3-41	In the ESC Pp. 9 & 10, BMPs are repeatedly considered sufficient for all storm water and erosion and sediment control issues for this project; yet “BMPs may not be required” at PICA. The wetlands or Green Pond Brook could be put at risk.	The ESC report identifies potential BMPs that may be included in the design of the roadway and rock storage areas. BMPs would be implemented as dictated by project conditions, however they are not required to reduce impacts below the level of significance. All mitigation required to reduce impacts below the level of significance is explicitly described in the document and summarized in Table 5-2.
86	NJ Highlands Coalition	3-41	There is no indication that a Flood Hazard Area permit been applied for regarding this project, although the paving in the riparian zones next to Green Pond Brook would require it.	A Flood Hazard Area permit has not been applied for with respect to road paving. It has not been determined whether paving next to the Brook would be performed. A transition area waiver was applied for the SAFER site and is administratively complete. Other listed permits would be applied for once design development is complete.
87	NJ Highlands Coalition	3-41	Permitting may be required if a sediment basin is to be constructed in or next to Green Pond Brook. And presumably, more trees will have to be cut down.	If a sediment basin is constructed in or next to the Brook, permitting would be required. Some trees would also likely have to be cut down. The specific design of the roadway paving has not been developed, nor has it been decided that paving would be performed. Paving operations would be limited to the existing roadway.
88	NJ Highlands Coalition	3-41	Lastly, it appears that a stabilized construction entrance will be established well south of the SAFER site and very close to the edge of Green Pond Brook. No provisions for or any permit requirements have been identified to prevent (tire) pressure washing rinse water from running into the nearby brook which is trout production waters. Rainfall can similarly move concentrated fines from this location into the brook.	The site design has not been finalized. Mitigation measures (e.g., silt fencing) to keep solids from entering Green Pond Brook have already been identified, and BMPs to further reduce impacts to the stream would be exercised as project conditions dictate.
89	NJ Highlands Coalition	3-44	What rodents or small mammals serve as prey for “amphibian populations”?	The complete sentence from the January 2012 EA states: "Rodents and other small mammals also serve as prey for the installation’s amphibian and reptile populations." Reptiles are more likely than amphibians to prey upon small mammals; however, some amphibians (e.g., bullfrogs) consume small mammals such as mice.
90	NJDEP	3-44	The EA briefly makes mention of the presence of invertebrates, but does not consider them any further in the document. "There are also more than 300 invertebrate species found at Picatinny, the most common of which are in the Donate and Lepidoptera families, including dragonflies, damselflies, butterflies and moths (Picatinny Arsenal, 2001)." It should be noted that the proposed access road runs adjacent to several wetlands and streams containing populations of Sable Club tail (Special Concern dragonfly species). This species breeds in and inhabits small rocky streams and drainages. This species could be potentially impacted by changes in hydrology due to runoff from increased areas of impervious surface created by roads. Runoff and associated stilt can alter areas critical for larval development by either washing away and substrate or silting in areas of suitable larval habitat. Appropriate precautions need to be taken to insure that stream hydrology at these locations is not altered and that runoff is minimized.	Proposed conservation measures to minimize the impact of sedimentation and runoff on wetlands and streams would serve to avoid and minimize any water quality impacts outside the Proposed Action area and minimize impacts to aquatic insects. Additionally, all State-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect State-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of State-listed species (beyond that conducted to develop the INRMP) was not required.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
91	NJ Highlands Coalition	3-45	Per table 3.8.1.3 in the EA there are at least eight state Threatened or Endangered species in this project area, however the same section only discusses one in any detail – timber rattlesnake; and barely mentions another – bobcat. The other six lack discussion or consideration of possible impacts to them. Wood turtle is listed in this vicinity yet not discussed.	All State-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect State-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of State-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
92	NJ Highlands Coalition	3-45	Per WET the eastern small foot bat is identified as one of the many species within the highest ranking habitat rating 5 of the N J Landscape Project Mapping; yet it is not discussed in the EA. This is a Federal candidate species that could become endangered.	All State-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect State-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of State-listed species (beyond that conducted to develop the INRMP) was not required.
93	NJ Highlands Coalition	3-45	Small Foot Bats might use the rock pile areas for roosting, as well as rodents and possibly wood rats, if any are in this vicinity. These species need to be considered. No indication is given if USFWS approved any other impacts, besides tree clearing, that may affect the already endangered bat. One cannot mitigate for a loss of a federal listed species. An incidental take statement should be here.	In a letter dated August 13, 2012, USFWS concurred that SAFER construction and operations activities may affect, but are not likely to adversely affect, the Indiana bat. In this letter, USFWS also noted, "Other than Indiana bat, no federally listed or proposed threatened or endangered flora or fauna are known to occur in the vicinity of the project site."
94	NJ Highlands Coalition	3-45	OSHA requires fences around the 2 acre site but it's only a guess if it is to keep snakes out. In the ESC many runoff diversion ditches or berms are planned, but their locations are not indicated. These may block the movements of reptiles over the ground. It is not specified if considerations or provisions for wildlife will be made by the natural resource biologist, a consultant, or the persons issuing an ESC permit or SPP plan. There are no decisions about roadway construction or rock pile designs and no permits have been prepared. Any specific details for the placement or layout of silt fences, much less "passage points" is not possible unless so specified; thus monitoring plans cannot even be drafted.	In areas where fencing/railing is required under OSHA regulations to prevent fall injuries, fencing will be installed. To also protect wildlife, the fencing will be designed to minimize the potential for fall injuries to wildlife. The exact design/specifications of the fencing have not yet been determined. Diversion ditches and berms can be designed such that they do not block the movement of reptiles. These considerations would be included in permit applications.
95	NJ Highlands Coalition	3-45	The region of influence (ROI) for wildlife and T & E species or species of concern extend to nearby adjacent surrounding areas through natural movement corridors or pathways and connected habitats. The limitation listed in the Table 3.0 –1 is arbitrary and shortsighted.	The ROI for the action is not the same as the range for the species affected. The ROI was defined using the best data available.
96	NJ Highlands Coalition	3-45	No indication as to who at "PICA and at NJDFW are conducting rattlesnake surveys."	Surveys were conducted by NJDEP ENSP-approved biologists.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
97	NJ Highlands Coalition	3-45	The idea that snakes will slither away due to noise is unfounded – snakes cannot hear, nor do they respond like most mammals. Snakes tend to freeze when vibrations or odors are uncertain to them. This assertion is baseless. As snakes are present in the construction areas, activities and noise are not likely to spook them as they would mammals. The risk of being run over seems high if they are close by the access roads or rock pile areas. No mitigation is indicated to prevent road or rock pile kills. No one is given the responsibility of "training drivers to identify a specific wildlife species". Copperheads are notoriously confused with water snakes among others. The only prudent approach is to stop when a reptile or amphibian is on the road and wait for it to safely move away; however rare and endangered species should be identified and documented by reliable witnesses so state sighting reports can be properly filed. This does not appear to be a practical approach to this wildlife concern or impact.	The EA text has been revised for clarification. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
98	NJ Highlands Coalition	3-45	Procedures to protect or move a snake must be provided.	If any listed snakes must be moved, they will be moved by NJDEP ENSP-approved personnel and using procedures outlined in the most current version of NJDEP's *Protocol for Venomous Snake Monitors and Spotters* . If NJDEP ENSP-approved personnel are not available onsite when a listed snake is sighted, then construction will cease until the snake moves out of harm's way or can be moved by qualified personnel. Any snake suspected to be a listed snake will be treated as a listed snake and will be reported to the Natural Resource Manager. ARDEC will identify individuals, one of whom will always be present at the site during construction, who will be responsible for determining the appropriate actions to take when any snake is sighted. These individuals will follow a decision tree to be developed by NJDEP ENSP-approved personnel, and may receive additional training in snake identification (beyond the training that will be given to all personnel at the SAFER site).
99	NJ Highlands Coalition	3-45	The 7 acres deforestation trees is not addressed. Precisely how the cleared land will be used is unclear, and whether or not this is the maximum needed for all road widening, road improvements, staging areas and new roads.	The footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document.
100	NJ Highlands Coalition	3-45	The EA mentions grubbing only one time, yet the SCHED lists 8-12 days.	The grubbing of the trees would occur within the restricted period from 16 November to 31 March. Based on the referenced project schedule, the total number of days for the clearing is planned to be 8-12 days. Grubbing would be minimized to the extent possible.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
101	NJDEP	3-50	"Although the Picatinny INRMP does not require specific surveys for state-listed species prior to ground disturbing activities, management guidelines for the timber rattlesnake include establishment of 1-mile radius zones of concern around hibernacula (Picatinny Arsenal, 2001). It is not currently known whether any timber rattlesnake hibernacula are present at the proposed SAFER site..." Although the Picatinny INRMP does not require surveys prior to ground disturbing activities, it does state under section 8.8.3 (State-listed Plants and Wildlife, item #2 under Wildlife) of the INRMP, "...the surveys will be done according to a schedule that is most efficient and sites will be identified for protection at that time." This implies that Picatinny Arsenal would protect critical sites that have been identified and would attempt to locate such areas during their planning process so that they may be protected in the future. NJ ENSP has identified critical habitats (and potential critical habitats) within and around the proposed SAFER site and has shared this information with Picatinny Arsenal, including preliminary evidence that at least one den is within a few hundred meters of the SAFER facility and a gestation/birthing area is within 75m of rock storage site B. In addition, NJ ENSP has informed PICA (including ARDEC) personnel of the likelihood of additional dens being located within and around their construction area, but that this can only be confirmed with proper surveys. INRMP, section 8.8.3 (State-listed Plants and Wildlife, item "a" under Wildlife) states, with regard to State-listed wildlife, "Protect and conserve state-listed wildlife within the Arsenal boundary using Best Management Practices." In addition, the Environmental Assessment pertaining to the INRMP (May, 2001), pg. 41 states, "There would be no incremental effects in the field or on the ground. Surveys and documentation would provide baseline data. Potentially positive effects would result from conducting surveys prior to ground-disturbing activities. Also, the plotting of species would avoid unnecessary damage to associated habitats. The protection of species once identified would increase species viability." NJ ENSP has shared critical habitat information with Picatinny Arsenal that should be included in the EA. PICA's proposed "best management practices" and mitigation measures will not minimize harm to rare snakes and turtles.	In consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Survey results, as well as mitigations developed based on those results, have been incorporated into the EA. Also, note that the INRMP states that the establishment of a 1-mile buffer zone around timber rattlesnake hibernacula is "contingent upon available resources or supplemental funding".
102	NJDEP	3-50	"…Also, Garrison policy is that, if timber rattlesnakes are encountered during construction or operations, trained handlers must respond and relocate the snake(s) because the timber rattlesnake is a state of protected species. Timber rattlesnakes must not be killed or molested." Statement that "...trained handlers must respond and relocate the snake(s)..." is inadequate. Picatinny Arsenal should present/propose a plan for such action given: it takes no less than 30 minutes to travel to the project site from the base. Will construction cease during that time period to await assistance? Will someone keep watch over the snake to ensure it is captured and moved? What will they do if the snake moves into a crevice within the workspace and is not retrievable; i.e., will they work elsewhere until the snake is captured? Picatinny does not have experienced handlers on the base for such a task. The ENSP has trained a few of the Picatinny Arsenal personnel to handle snakes, but they do not have the experience required to assess the situation and determine the best strategy to use. For example, different techniques and strategies are used to address gravid vs. no gravid females, a mating pair in courtship vs. a mating pair in copulation, a post-partum female with [likely] scent-trailing young; all requiring different strategies in order to protect both the snake(s) and the handler(s). What relocation protocol will they implement? Who will properly identify the snakes on-site (i.e., prior to PICA's "trained handlers") to avoid misidentification.	As a clarification, the Federal government is not subject to statutes regarding State-listed species; however, the installation will follow the State-approved INRMP. The EA has been revised to provide the following, "The INRMP states if timber rattlesnakes are encountered during construction or operations, trained handlers must respond and relocate the snake(s) because the timber rattlesnake is a State-protected species. Timber rattlesnakes must not be killed or molested." Please refer to mitigations listed in Table FNSI-2 or Table 5-2 of the EA.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
103	NJDEP	3-50 - 3-51	"Picatinny Arsenal and NJDFW are in the process of constructing surveys for timber rattlesnakes within the proposed SAFER project site, to include the proposed rock storage sites. The surveys would be conducted to consider seasonal variations in snake locations and habituation within the area. The first of the surveys was conducted in August 2011, and timber rattlesnakes were observed in the vicinity of the SAFER site." Only one survey has been conducted. NJDFW, ENSP did conduct one survey in August 2011, four were required (August) in addition to den (April-May) and basking site surveys (late-May through mid-June; timing for all surveys is weather dependent). ENSP continues to strongly recommended that Picatinny Arsenal contract ENSP-approved, qualified rattlesnake surveyors to complete the surveys in a timely manner prior to the commencement of construction and/or site preparation. ENSP findings (documented in the attached interim gestation report, Scants 2011) identify critical areas and provide recommendations to Picatinny Arsenal personnel to minimize harm to the snakes; many recommendations reiterate those provided to Picatinny Arsenal through a letter dated September 19, 2011 (from Kris Scants, ENSP to Tom Solei, Chief of the Environmental Affairs Division).	All NJDEP-recommended surveys for listed snakes were completed during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
104	NJ Highlands Coalition	3-50 & 3-51	Who is Buried, 2011 that is referenced?	As discussed on page 3-51 of the January 2012 EA, Mr. Mark Buried of the NJDFW was consulted in the preparation of the EA to discuss the findings of an August 1987 study and to determine if more recent studies have been conducted to verify the presence of brook trout in Green Pond Brook.
105	NJDEP	3-51	"Garrison policy is that, if copperheads are encountered during construction or operations, trained handlers must respond and relocate the snake(s) because the copperhead is a state protected species. Copperheads must not be killed or molested." Statement that "...trained handlers must respond and relocate the snake(s)..." is inadequate. Picatinny Arsenal should present/propose a plan for such action given: it takes no less then 30 minutes to travel to the project site from the base. Will construction cease during that time period to await assistance? Will someone keep watch over the snake to ensure it is captured and moved? What will they do if the snake moves into a crevice within the workspace and is not retrievable; i.e., will they work elsewhere until the snake is captured? As indicated above when commenting on timber rattlesnakes, Picatinny does not have experienced handlers on the base for such a task. The ENSP has trained a few of the Picatinny Arsenal personnel to handle snakes, but they do not have the experience required to assess the situation and determine the best strategy to use. For example, different techniques and strategies are used to address gravid vs. no gravid females, a mating pair in courtships vs. a mating pair in copulation, a post-partum female with [likely] scent-trailing young; all requiring different strategies in order to protect both the snake(s) and the handler(s). What relocation protocol will they implement? Who will properly identify the snakes on-site (i.e., prior to PICA's "trained handlers") to prevent misidentification?	If any listed snakes must be moved, they will be moved by NJDEP ENSP-approved personnel and using procedures outlined in the most current version of NJDEP's Protocol for Venomous Snake Monitors and Spotters. If NJDEP ENSP-approved personnel are not available onsite when a listed snake is sighted, then construction will cease until the snake moves out of harm's way or can be moved by qualified personnel. Any snake suspected to be a listed snake will be treated as a listed snake and will be reported to the Natural Resource Manager. ARDEC will identify individuals, one of whom will always be present at the site during construction, who will be responsible for determining the appropriate actions to take when any snake is sighted. These individuals will follow a decision tree to be developed by NJDEP ENSP-approved personnel, and may receive additional training in snake identification (beyond the training that will be given to all personnel at the SAFER site).
106	NJDEP	3-55	Based on the information provided in the EA, ENSP does not support the claim that there will be "no impact." There are needs to be documentation that addresses how PICA will handle situations if mammals are injured (or killed) from falling over the driveway and/or staging area walls (a maximum of ~80ft). Although PICA proposed to install a fence (with some measure to minimize harm to wildlife), there is no description of the fence or long-term maintenance/repairs of the fence, and therefore, based on the information provided, there is a potential for wildlife to accidentally fall and no measures in place to respond.	In areas where fencing/railing is required under OSHA regulations to prevent fall injuries, fencing will be installed. To also protect wildlife, the fencing will be designed to minimize the potential for fall injuries to wildlife. The exact design/specifications of the fencing have not yet been determined. Implementation of mitigation activities will be monitored by the government in accordance with recent CEQ guidance on the "Appropriate Use of Mitigation, Monitoring, and Mitigated FONSIs."

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
107	NJDEP	3-55 - 3-56	EA claims "Minor Impact with Proposed Mitigation." NJDEP does not support this statement as indicated in general comments above and in other references in this comment document. "The primary risk to fish, amphibians, and some reptiles posed by the construction of the SAFER is the potential degradation of water quality in Green Pond Brook and adjacent wetlands." While the aquatic resources and value are known and measures are being proposed to protect water quality, little is known about the local Timber Rattlesnake, Northern Copperhead, Eastern Box Turtle populations and the upland and nesting habitats of the Wood Turtle. ENSP has provided evidence that rattlesnakes inhabit the area and with minimal data, we can state without question that at least one den/hibernacula exists in the area. There is [perhaps] a greater risk to rattlesnakes and copperheads since construction and site preparation is planned to occur without knowledge of the locations of dens, gestation and birthing areas, and without proper mitigation measures to minimize harm to dispersing snakes. Mitigation measures for turtles are also inadequate. "There is also potential for amphibians and reptiles to be adversely impacted by the destruction of forested habitat, as well as by noise and disturbance created by blasting and use of heavy machinery during construction." Destruction of habitat, increased vehicular traffic during construction (and operation) and the creation of the rock-storage sites during these species' active season can all adversely impact them. "...noise and disturbance..." is a factor during their active season as it may attract snakes to the construction area putting them in harm's way.	All State-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect State-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain State-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of State-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
108	NJDEP	3-56	"To mitigate impacts during construction due to increased traffic on the access road to the proposed SAFER site, traffic control measures would be implemented, including driver training and signage indicating speed limits." What specific measures will be implemented and who will develop these measures; i.e., what expert(s) will PICA work with?	Training will be developed and/or reviewed and approved by NJDEP ENSP-approved snake personnel. It will include information on snake identification, procedures to be followed if a snake is encountered, requirements and prohibitions under New Jersey state law, and requirements for drivers. Information and requirements related to other listed species (e.g., wood turtles) will also be included. Additionally, speed limit signs (15 miles per hour) along Upper Gorge Road will be posted. The Army will also work with the Picatinny Safety office to finalize and implement the specific requirements of the traffic control measures. Implementation of mitigation activities will be monitored by the installation in accordance with recent CEQ guidance on the "Appropriate Use of Mitigation, Monitoring, and Mitigated FONSIs".
109	NJDEP	3-56	EA claims "No impact," "No impacts to reptiles, amphibians, or fish are expected due to SAFER operations. While there would be some increased noise and disturbance in comparison to the No Action Alternative, no measurable impacts on reptile, amphibian, or fish populations are expected." NJDEP does not support this statement, without complete biological data regarding rare snakes and turtles in the area. Snakes and turtles have defined travel corridors leading to and from their hibernacula to their summer ranges. Creating barriers can disorient them, the use of a fence to detour them could increase the likelihood of predation as they wander along the fence-line to circumvent the barrier, the driveway entrance is open and snakes and turtles could become trapped within the driveway and/or staging area making them easy prey for other wildlife and/or personnel unfamiliar with NJ's laws, and increased traffic during the long-term operation and maintenance of the facility could increase road mortality and/or fatal injuries.	All State-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect State-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain State-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of State-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
110	NJDEP	3-56	"(Minor to Moderate Impact with Proposed Mitigations) Potential impacts to federal and selected state-listed fish and wildlife species due to construction are discussed further in this section." The EA has given no consideration to the potential impacts to the small-footed motes, a species of regional concern and one whose status is currently being reviewed by the USFWS as a result of a formal petition to list the species under the Federal Endangered Species Act. The rock storage area will create roosting habitat that could potentially be used by the small-footed motes. Currently little is known about habitat use and occurrence of the small-footed motes in the vicinity of PICA. However, recent prehibernation surveys conducted at the Mt. Hope Mine during the fall of 2011 resulted in the capture of 21 animals. Due to the proximity of the mine to the proposed SAFER development it is possible that this species utilizes the area. Recent research has discovered that small-footed motes in the northeast will readily utilize man-made rock piles for roosting habitat. If small-footed motes utilize the rock storage area for roosting, special precautions should be in place to protect this species from take while the bats are present.	All State-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect State-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain State-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of State-listed species (beyond that conducted to develop the INRMP) was not required.
111	NJDEP	3-56 - 3-57	"(Minor Impact) Impacts to special status species due to SAFER operations are expected to be minor, at worst. Very minor impacts to all listed species could be expected due to slightly increased noise and disturbance associated with SAFER operations. As previously discussed, detonations during operations would occur in the underground SAFER, and noise impacts are expected to be minimal." For clarification, it appears PICA includes "select state-listed fish and wildlife species" as species having "special status" given the statement under Construction in this section.	For clarity, the term, "special status species", has been removed from the EA and replaced with "state-listed species" or "federal and state-listed species", as appropriate.
112	NJ Highlands Coalition	3-57	Has USFWS rendered a biological opinion for this project?	In a letter dated August 13, 2012, USFWS concurred that SAFER construction and operations activities may affect, but are not likely to adversely affect, the Indiana bat. Therefore, no Biological Opinion is required under Section 7 of the Endangered Species Act.
113	USFWS NJFO	3-57, 3-59	The draft EA uses language that is not consistent with the ESA. On these pages the EA suggest mitigation measures for protecting the Indiana bat. However, within the context of the ESA, mitigation refers only to activities that may be done to offset, rectify, or compensate for the impact of an action. Avoiding or reducing the impact is referred to as minimization. The EA also identifies incidental mortality during construction. If there is anticipated incidental mortality, the Federal action agency must obtain an incidental take statement through formal Section 7 consultation with our office.	The EA has been revised to clarify the terminology used. Specifically, the EA now includes a glossary. Incidental mortality, or take, of the Indiana bat was never an anticipated impact, and the EA has been revised accordingly.
114	NJ Highlands Coalition	3-57	Will the schedule be planned to avoid certain seasons or months to minimize impacts to various wildlife?	Seasonal restrictions on tree cutting and blasting will be implemented to prevent impacts to Indiana bats. These tree cutting restrictions will also serve to protect other wildlife, such as breeding birds. Refer to mitigations listed in Table FNSI-2 or Table 5-2 of the EA.
115	NJ Highlands Coalition	3-58	The last sentence suggests that blasting or construction activities might occur after sunset and before sunrise. Is this true?	Based on consultation with USFWS, the revised FNSI and EA include mitigations that prohibit blasting from one hour before sunset to one hour after sunrise. Refer to Table FNSI-2 or Table 5-2 of the EA.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
116	NJDEP	3-59	Surveys have not been completed in the proposed area to identify critical dens, gestation and birthing habitats. Preliminary survey in August 20 II revealed a gestation and birthing site within 75m of proposed rock storage site B and is an indicator that at least one den is in close proximity. Habitat assessments during this survey revealed suitable den, gestation and birthing habitats within and around the proposed SAFER site (and rock storage areas). Lacking this data makes it impossible to determine the impacts on this species regardless of mitigation measures.	All NJDEP-recommended surveys for listed snakes were completed April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
117	NJDEP	3-59	" ... Mortality during clearing and construction is unlikely (noise generated by construction activities would cause snakes to flee or avoid the area), as long as no hibernacula are present at the site during tree felling or any ground disturbing activities that may occur in winter and spring ... " o Timber Rattlesnakes do not necessarily need or avoid areas of construction. In fact, during recent pipeline construction in New Jersey it was noted that not only were Timber Rattlesnakes and Northern Copperheads (in addition to other species) found on the construction site, but some snakes were repeat offenders and difficult to deter from the construction area. Additional data documented in 20 II also indicates the snakes may in deed be attracted to the vibrations rather than fearful of them. " ... as long as no hibernacula are present. .. " Regardless of the activity and timing, if hibernacula are present and subsequently destroyed, it is more likely that the local den/hibernacula population will be killed (if destroyed/altered during hibernation) or will die off (freeze to death) as they move back to their hibernacula for the winter since Timber Rattlesnakes and Northern Copperheads have strong fidelity to their hibernacula and it is unlikely that individuals would move to another hibernaculum/den.	All NJDEP-recommended surveys for listed snakes were completed April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
118	NJDEP	3-59	"Picatinny Arsenal is in the process of conducting a series of snake surveys to avoid possible impacts to known snake hibernacula. The surveys would continue beyond acceptance of this NEPA document, but impacts to the timber rattlesnake may be minimized by adopting the proposed mitigations below." " ...known snake hibernacula..." This implies that PICA is aware of the location(s) of snake hibernacula within and around this project site. This is untrue. NJ's ENSP conducted one gestation survey and one habitat assessment survey in August 2012 and findings indicate that at least one hibernaculum/den is in close proximity to rock storage site B. Furthermore, the habitat assessment revealed suitable habitat for dens and gestation/birthing areas in close proximity to the proposed SAFER facility. No sites have yet been located; additional surveys (per ENSP recommendations) are needed. Surveys must be conducted prior to the commencement of construction activities (including but not limited to rock piling/dumping, excavation, blasting, etc.). Surveys must also be conducted prior to tree-clearing if tree-clearing will be completed with machinery (e.g., bulldozers) that could potential alter/shift rock habitat. However, if tree-clearing is selective (i.e., PICA allows trees and shrubs to remain in tact around ENSP-identified rock outcrops) and cuts are conducted manually and felled trees are removed without disturbing rock outcrops, surveys need not be completed prior to tree-cutting. Felled trees should not remain within the rock storage areas as these will become attractants to reptiles, amphibians and small mammals, and they could be killed or injured as rock debris is dumped on top of the logs. Surveys must be conducted in August (gestation/birthing), approximately mid-April through mid-May (dens) and approximately late May-early June for transient/basking habitat per NJDEP ENSP's recommendations. Per NJDEP/PICA (including ARDEC) personnel meetings, PICA is intending to construct the SAFER facility in 2012 regardless of whether or not recommended (and necessary) surveys are completed.	All NJDEP-recommended surveys for listed snakes were completed April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. These mitigations include requirements related to felled trees and brush.
119	NJDEP	3-59	"Noise impacts are also expected to be minor. Although blasting or other construction noise may cause any snakes that are present to flee the immediate area, the availability of adjacent high-quality habitat should serve to minimize impacts." There is anecdotal evidence that indicates snakes may be attracted to the vibrations caused from the machinery and blasting thereby putting them and workers in harm's way.	The EA text has been revised for clarification. Results of snake surveys, and mitigations developed based on those results, have been incorporated into the EA.
120	NJDEP	3-59	"Based on meetings with NJDEP, the Garrison agreed on the following mitigations:" NJDEP's ENSP does not endorse the mitigation measures outlined in this EA as minimizing/diminishing harm to species at risk (Timber Rattlesnakes and Wood Turtles) and State species of Special Concern, Northern Copperheads as well as upland turtles (i.e., Eastern Box Turtles and common species).	The EA text has been revised for clarification. Results of snake surveys, and mitigations developed based on those results, have been incorporated into the EA.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
121	NJDEP	3-59	Bullet 1: "The Government would permit seasonal surveys ... conducted by qualified professionals." Surveys must be conducted prior to the commencement of construction activities (including but not limited to rock piling/dumping, excavation, blasting, etc.). Surveys must also be conducted prior to tree-clearing if tree-clearing will be completed with machinery (e.g., bulldozers) that could potential alter/shift rock habitat. However, if tree-clearing is selective (i.e., PICA allows trees and shrubs to remain in tact around ENSP-identified rock outcrops) and cuts are conducted manually and felled trees are removed without disturbing rock outcrops, surveys need not be completed prior to tree-cutting. Felled trees should not remain within the rock storage areas as these will become attractants to reptiles, amphibians and small mammals, and they could be killed or injured as rock debris is dumped on top of the logs. Surveys must be conducted in August gestation/birthing), approximately mid-April through mid-May (dens) and approximately late May-early June for transient/basking habitat per NJDEP ENSP's recommendations. Per NJDEP/PICA (including ARDEC) personnel meetings, PICA is intending to reconstruct the SAFER facility in 2012 regardless of whether or not recommended (and necessary) surveys are completed. " ... qualified professionals": Who determines/how is it determined who is qualified to conduct such surveys? Who are the qualified professionals?	All NJDEP-recommended surveys for listed snakes were completed April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. These mitigations include requirements related to felled trees and brush. If any listed snakes must be moved, they will be moved by NJDEP ENSP-approved personnel and using procedures outlined in the most current version of NJDEP's *Protocol for Venomous Snake Monitors and Spotters* . If NJDEP ENSP-approved personnel are not available onsite when a listed snake is sighted, then construction will cease until the snake moves out of harm's way or can be moved by qualified personnel. Any snake suspected to be a listed snake will be treated as a listed snake and will be reported to the Natural Resource Manager. ARDEC will identify individuals, one of whom will always be present at the site during construction, who will be responsible for determining the appropriate actions to take when any snake is sighted. These individuals will follow a decision tree to be developed by NJDEP ENSP-approved personnel, and may receive additional training in snake identification (beyond the training that will be given to all personnel at the SAFER site).
122	NJ Highlands Coalition	3-59	What is typical usable life of geo-liner per manufacturer? Is it multi-decades?	Many factors affect the life expectancy of a geoliner (e.g., exposure to the sun's ultraviolet radiation and contact with corrosive materials). The geoliner to be used at the SAFER would have favorable conditions and should remain intact for many years. One geoliner manufacturer states, "Many of our liners are appropriately stabilized to survive up to 20 years or more in the Continental U.S. Your project location and details will help to determine the expected longevity for your application."
123	NJ Highlands Coalition	3-59	Will vehicle oils and lubricants rinse into the nearby Green Pond Brook more easily after paving and more of it with added traffic?	Vehicles associated with the SAFER construction and operation would be routinely inspected, and only vehicles and equipment with no known lubricant leaks would be used on the project. Any noted leaks or spills would be cleaned immediately, and the associated vehicles/equipment would be identified and maintained to eliminate spilled lubricants in the future. Paved areas would not be dirt-free, and any small amounts of lubricants that do reach the pavement would interact with the dust and dirt on the pavement to keep them from traveling very far before cleanup. By paying close attention to good housekeeping measures and BMPs, no adverse impact on Green Pond Brook is expected due to lubricants from vehicles and equipment associated with the SAFER.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
124	NJDEP	3-60	Bullet 2: "Picatinny Arsenal would utilize best construction practices in order to protect listed snakes ... Natural Resource Manager would be notified. Rattlesnakes and copperheads ... molested." This mitigation measure is inadequate to protect listed snakes. PICA does not outline what they consider "best construction practices in order to protect listed snakes." Who (i.e., identify a Timber Rattlesnake snake expert that) is determining the "best construction practices" that will protect snakes? What is the plan if the Natural Resource Manager is not available? What is the plan if the Natural Resource Manager is available given it takes no less than 30 minutes to access the project area from the administrative buildings? " ... best construction practices ... ", "BMPs", "mitigation measures": The use of these three phrases throughout the document is confusing. Are "best construction practices" the same as "BMPs" or are they considered "'mitigation measures"? Pg. ES-1, last statement: " ... BMPs are not required, but would help the installation to minimize impacts of the Proposed Action for those resource areas." If BMPs are not required, will they be implemented or are they considered optional by PICA? See comment below regarding Pg. 5-1, 2"" paragraph. How will they deal with the delay in response (i.e., it takes no less than 30 minutes from base to project site)? Will they cease construction until assistance arrives and the snake relocated? As detailed previously, PICA does not have experienced handlers on the base to assess snake situations and determine the best strategy to use. In addition: What relocation protocol will they implement? Who will properly identify the snakes on-site (i.e., prior to PICA's "trained handlers") to prevent misidentification?	In consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. If any listed snakes must be moved, they will be moved by NJDEP ENSP-approved personnel and using procedures outlined in the most current version of NJDEP's Protocol for Venomous Snake Monitors and Spotters. If NJDEP ENSP-approved personnel are not available onsite when a listed snake is sighted, then construction will cease until the snake moves out of harm's way or can be moved by qualified personnel. Any snake suspected to be a listed snake will be treated as a listed snake and will be reported to the Natural Resource Manager. ARDEC will identify individuals, one of whom will always be present at the site during construction, who will be responsible for determining the appropriate actions to take when any snake is sighted. These individuals will follow a decision tree to be developed by NJDEP ENSP-approved personnel, and may receive additional training in snake identification (beyond the training that will be given to all personnel at the SAFER site).
125	NJDEP	3-60 (Bio)	Bullet 3: "All people entering the construction site would be educated in identification and hazards of snakes and procedures to be followed if a rattlesnake or copperhead is encountered." This mitigation measure is inadequate and requires additional detail. What exactly does "training" include? Who (i.e., identity a Timber Rattlesnake snake expert that) will train the "people entering the construction site"? What information specifically will they be given? What guidelines will they be required to implement? Who will enforce the measures to ensure workers adhere to their training guidance?	Training will be developed and/or reviewed and approved by NJDEP ENSP-approved personnel. It will include information on snake identification, procedures to be followed if a snake is encountered, requirements and prohibitions under New Jersey state law, and requirements for drivers. Information and requirements related to other listed species (e.g., wood turtles) will also be included. Additionally, speed limit signs (15 miles per hour) along Upper Gorge Road will be posted. The Army will also work with the Picatinny Safety office to finalize and implement the specific requirements of the traffic control measures. Implementation of mitigation activities will be monitored by the installation in accordance with recent CEQ guidance on the "Appropriate Use of Mitigation, Monitoring, and Mitigated FONSIs".

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
126	NJDEP	3-60	Bullet 4: "Prior to moving any rock out of rock storage sites between 1 April and 1 Oct, the Arsenal would require the Natural Resource Manager to perform a survey of the site for snakes and to monitor the site daily for any signs of snake activity while the rock removal is in process. Picatinny Arsenal would install fencing around the SAFER site in areas required by OSHA regulations. The fencing would have features that minimize the potential for snakes to breach the fence." This mitigation measure is inadequate. The rock storage sites should not be drawn from during the snakes' active period (April 1-October 31). Surveying the rock piles prior to removing rocks will not suffice given snakes can access crevices and go unnoticed, putting them in harm's way as machinery draws from the rock piles. PICA should provide details regarding: What "features" they will use in the fencing to minimize the potential for snakes (and turtles) to breach the fence, outline the long-term maintenance of the fence, and propose for implementation daily (or sufficiently frequent - as developed with and agreed upon by NJ ENSP) surveys of the fence during the snakes' and turtles' active periods, especially when the SAFER site is not in daily use, to ensure no animals become trapped and/or injured.	Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. These mitigations include requirements related to felled trees and brush, and requirements related to any activities occurring at Rock Storage Area B. Refer to Table FNSI-2 or Table 5-2 of the EA. The Rock Storage Areas will not be fenced. Refer to the response to Comment 106 regarding fencing at the SAFER chamber. Implementation of mitigation activities will be monitored by the installation in accordance with recent CEQ guidance on the "Appropriate Use of Mitigation, Monitoring, and Mitigated FONSIs".
127	NJDEP	3-60	Bullet 5: "Passage points for snakes and other wildlife would be included in all silt fencing." What does this mean? How will they provide such access for travel? PICA should provide details regarding proposed measures.	The installation of silt fencing has the potential to block the movement of snakes and other wildlife. Silt fences can be designed and placed in overlapping arced segments such that storm water is captured, yet wildlife can still pass.
128	NJDEP	3-60	Bullet 6: "To mitigate impacts during construction due to increased traffic on the access road to the proposed SAFER site, traffic control measures would be implemented, including driver training and signage indicating speed limits. In particular, drivers must be alert for snakes crossing Upper Gorge Road during spring and summer, when they are commonly encountered." This mitigation measure is inadequate as written and requires more detail on implementation and enforcement. Who (i.e., identify an expert that) will provide the training and information needed to minimize harm to the State's snakes and turtles? What information will the training include and what standards/guidelines will workers be required to implement in order to avoid and/or not disturb snakes and turtles? What speed limit will workers be limited to? Who will enforce the measures to ensure workers adhere to their training guidance?	Training will be developed and/or reviewed and approved by NJDEP ENSP-approved personnel. It will include information on snake identification, procedures to be followed if a snake is encountered, requirements and prohibitions under New Jersey state law, and requirements for drivers. Information and requirements related to other listed species (e.g., wood turtles) will also be included. Additionally, speed limit signs (15 miles per hour) along Upper Gorge Road will be posted. The Army will also work with the Picatinny Safety office to finalize and implement the specific requirements of the traffic control measures. Implementation of mitigation activities will be monitored by the installation in accordance with recent CEQ guidance on the "Appropriate Use of Mitigation, Monitoring, and Mitigated FONSIs".
129	NJDEP	3-60	"Construction and Operations. (Minor Impact with Proposed Mitigation) Impacts to the copperhead snake are expected to be minor and generally similar to those described above for the timber rattlesnake." See comment below paragraph 2.	In consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. Based on the new information and analysis, Picatinny Arsenal maintains that, with the implementation of the proposed mitigations, impacts to listed snakes are likely to be minor to moderate.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
130	NJDEP	3-60	"Proposed Mitigation. The mitigations listed above for the timber rattlesnake, which is more likely to be present at the SAFER site due to its habitat preferences, would also serve to protect the nor them copperhead. No surveys for the northern copperhead are planned or recommended." These statements are unfounded as surveys have not been completed in the proposed area to identify critical dens, gestation and birthing habitats. Lacking this data makes it impossible to determine the impacts on this species regardless of mitigation measures. As detailed within these comments, the proposed mitigation measures to minimize harm to Northern Copperheads are inadequate, as outlined within the sections pertaining to Timber Rattlesnakes. There is no evidence to conclude that rattlesnakes are more likely present than copperheads at this site. Suitable habitat persists within and immediately adjacent to the SAFER site and rock storage areas for 1101thern copperheads. Since copperheads are typically more cryptic as they often sit under leaf litter, there is a greater chance that copperheads (rather than rattlesnakes) will go unnoticed thereby making them (perhaps) more susceptible to construction/site preparation activities. NJDEP's ENSP recommended Northern Copperhead surveys in conjunction with Timber Rattlesnake surveys in the letter dated September 19, 2011. ENSP continues to support this recommendation.	The quoted text, "...which is more likely which is more likely to be present at the SAFER site due to its habitat preferences", has been deleted from the EA, in accordance with this comment. In consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys (for both the copperhead and the timber rattlesnake) during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. Based on the new information and analysis, Picatinny Arsenal maintains that, with the implementation of the proposed mitigations, impacts to listed snakes are likely to be minor to moderate.
131	NJDEP (6Feb12)	3-65-3-66	For each accumulation unit, generators must comply with specific disposal and decontamination requirements once they cease operating these units. Large Quantity Generators (LQGs) must comply with the generic closure requirements in 40 C.F.R. 265.111(a) and (b) and 265.114, and the unit specific closure requirements found in 40 C.F.R. Part 265, Subpart I (containers), Subpart J (tanks), Subpart W (drip pads), and Subpart DD (containment buildings).	The EA states that construction and operation of the SAFER facility would adhere to all DOD, Federal, State, and local hazardous waste requirements. Section 3.11 of the EA has been revised to include additional detail on the applicability of RCRA to wastes generated in the SAFER, including closure requirements when the unit is ultimately taken out of service.
132	NJDEP (6Feb12)	3-65-3-66	The closure requirements include removing and decontamination all contaminated equipment, structures, and soils to minimize the need for further maintenance and prevent post-closure escape of hazardous waste. There are no specific closure requirements for Small Quantity Generators (SQGs) and Conditionally Exempt Small Quantity Generators (CESQGs), except that SQGs are subject to the requirements for accumulating hazardous waste in tanks, including closure.	The EA states that construction and operation of the SAFER facility would adhere to all DOD, Federal, State, and local hazardous waste requirements. Section 3.11 of the EA has been revised to include additional detail on the applicability of RCRA to wastes generated in the SAFER, including closure requirements when the unit is ultimately taken out of service.
133	NJDEP (6Feb12)	3-65-3-66	Scrap casing fragments must be flashed (open burned) or hot air decontaminated before these fragments can be considered scrap metal and no longer regulated as hazardous waste.	The EA states that construction and operation of the SAFER facility would adhere to all DOD, Federal, State, and local hazardous waste requirements. The document will be revised to include a clarification of requirements and procedures. Section 3.11 of the EA has been revised to indicate that any waste munitions from the SAFER that are to be recycled as scrap metal will fast be properly demilitarized and decontaminated.
134	NJ Highlands Coalition	3-67	The roof of chamber is too close to surface (30 ft.) according to criteria in Appendix B.	The undisturbed competent rock above the chamber was determined by the construction contractor, based on borings taken in the area and corresponding test results. Results were presented in the Rock Stability Report where the required distance from the roof of the chamber to the ground surface was reported. The discrepancy in the distances to the surface arose from a change in the conceptual design after preliminary borings were analyzed and the results taken into account (see response to Comment 45).
135	NJ Highlands Coalition	3-70	Isn't a cave-in a hazard?	As stated in Section 2.3.2, Alternative SAFER Locations, and 2.3.3, Preferred Alternative, subsection on Site Preparation, initial rock studies indicated that the Preferred Alternative site is not likely to be subject to cave-in. Resistance to cave-in was one of the key site selection criteria.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
136	NJ Highlands Coalition	3-70	There is no mention of OSHA requirements in this section; yet the sight will apparently be fenced for some safety reason (page 3-60) – why?	In areas where fencing/railing is required under OSHA regulations to prevent fall injuries, fencing will be installed. To also protect wildlife, the fencing will be designed to minimize the potential for fall injuries to wildlife. The exact design/specifications of the fencing have not yet been determined.
137	NJ Highlands Coalition	4-1	Many direct and indirect effects and their impact have not been adequately or credibly addressed in the EA or other supporting documents. Also, the sparse assertions regarding cumulative effects lack credibility. P 28, section 6 of the ESC sums up the problem throughout this EA and its processes. If these are mere “recommendations” and “only at a conceptual level”, and do not reflect any specific state or county permit conditions or requirements which have not yet been formulated or issued, impacts cannot be assessed, much less can a FNSI be justified.	An Erosion and Sediment Control Plan is a reference document used in the EA to help create BMPs and mitigate potential erosion and sedimentation from the Proposed Action. A NEPA document is a planning tool and assesses different alternative actions. The final design is not required to produce legally and technically sufficient analysis.
138	NJ Highlands Coalition	4-1	This EA and its supporting documents seem to be sufficient as an initial framework or outline for a more thoughtful and amplified EIS, but it is not a FNSI by any standard.	The EA is prepared in accordance with 32 CFR 651, *Environmental Analysis of Army Actions* . A mitigated EA is a valid way to analyze the impacts of an action where significant impacts can be mitigated below the level of significance. Furthermore, the analysis contained in this document and the procedures followed regarding stakeholder and public involvement are in accordance with recent guidance issued by CEQ on *Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact* .
139	NJ Highlands Coalition	4-4	Where will the “temporary refuse storage area be established” near or on the SAFER site? How large an area will this entail?	Specific engineering design details would be finalized in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document.
140	NJ Highlands Coalition	4-4	What mitigation measures or BMPs WILL be adopted to minimize attraction of nuisance or other wildlife?	Picatinny Arsenal maintains an Installation Pest Management Plan for nuisance animals and wildlife and would continue to do so during the Proposed Action.
141	NJ Highlands Coalition	4-4	Time parameters for the “significant noise levels” from blasting events are not specified.	Blasting events would occur during peak business hours (8am-5pm) to minimize impacts to the natural environment. Additionally, as a mitigation for the protection of the Indiana bat, blasting will be prohibited from one hour before sundown to one hour after sunrise during 1 April through 15 November.
142	USFWS NJFO	4-57	Noise associated with the construction of the SAFER site would include rock blasting and typical construction noises such as heavy trucks and bull dozers. Approx. 1,000 pounds of Ammonium Nitrate/Fuel Oil would be used each day for rock blasting over the course of 78 days. Blasting would not happen at once, rather there would be approx. 10-20 smaller blasts each day. Data are not available for the actual noise during the anticipated blasting; however, similar activities of blasting from construction and mining operations indicate an average noise level of 85-95 decibels. On these pages, the draft EA briefly addresses these impacts on the Indiana bat. The draft EA mentioned "noise may impact bats by interfering with echolocation, causing arousal during roosting or hibernation, inducing stress, causing avoidance of preferred habitats, or causing hearing loss." As described, these impacts could adversely affect the Indiana bat. The EA should clarify how construction noise would affect Indiana bats.	EA Sections 3.4 and 3.9.2.3 have been revised to include additional information regarding potential noise impacts to Indiana bats. USFWS reviewed the revised text and, in a letter dated August 13, 2012, concurred that SAFER construction and operations activities may affect, but are not likely to adversely affect, the Indiana bat.
143	NJ Highlands Coalition	4-6	Why isn’t this area avoided (like it was in April, 2010 per EA for FCTS) or monitored due to its critical and sensitive and wild life habitats?	With mitigation in place, there would be no significant impact to the natural environment. Site selection criteria are clearly defined in Chapter 2, the Description of the Proposed Action and Alternatives.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
144	NJ Highlands Coalition	A-4	ROG is not defined or in acronym list. What is ROG?	ROG is Reactive Organic Gases. The EA has been revised to add this acronym to the list and is listed in table footnotes.
145	NJ Highlands Coalition	A-5	This table has erroneous values (e.g. column 5 for dump truck); and invalid foot notes.	The subject tables and footnotes have been updated.
146	NJ Highlands Coalition	A-9	Row 2 appears to populate from table H-4 totals; Row 3 should likely populate from table H-7 totals; yet there seems to be an unknown factor at play with the numbers – explain?	Table A-14 is a rollup of the emissions included in other Appendix A tables, and this table contains the correct values.
147	NJDEP	A-12	The EA states, " Based on the air quality analysis for the Proposed Action, the maximum estimated emissions would be below conformity de minimis levels and would be less than 10 percent of projected regional emissions. The United States Environmental Protection Agency (USEPA) deleted the regionally significant test (40 CFR 93.1S3(i) and (j) in its Revisions to the General Conformity Regulations Final Rule on April 5, 2010.	The EA has been revised to delete references to regional significance.
148	NJ Highlands Coalition	D-1	In Appendix D of the EA, the letter implies that 7 acres of trees may be bulldozed rather than cut down. No specifics are provided as to the necessity of the method, or how the tree scrap will be disposed. If burned, it is unclear if air quality permits will be required. If waste wood is generated, a plan should be made to recycle rather than disposed, or abandoned on site.	Grubbing would be minimized to the extent possible; current plans are to fell trees by chainsaw. Mitigations for listed snakes include requirements related to disposition of felled trees and brush. Refer to Table FNSI-2 or Table 5-2 of the EA.
149	NJ Highlands Coalition	General	Lack of transparency and accountability regarding this proposed project and environmental management for this dFNSI (40 CFR 1507.2). Projects developed under NEPA standards require assigned personnel and resources to manage NEPA processes as a component of project development. No NEPA responsibility is specified for the project. There is no list of persons assigned to manage the environmental aspect of the projects or consultants with the expertise or credentials to indicate with any confidence that resources at risk could be identified, adverse impacts would be assessed and avoided where possible, and that where necessary, proper mitigation would be provided. The only individual identified with the project is Mr. Peter Rowland, a Public Affairs officer, and only a post office address provided as the sole point of contact. The draft FNSI (p.7) concludes that "the respective decision makers have determined that, with the implementation of specified mitigation measures, building and operating the SAFER would have no significant effects on human health or the natural environment, and would have no significant cumulative effects on human health or the natural environment." It is entirely without merit to claim that any determination can be reached if "the respective decision makers" have not been identified, or to what reference they are "respective".	Per 40 CFR 1502.17, the names and qualifications of persons who were primarily responsible for preparing the EA are included in the List of Preparers. Traditionally, the decision-maker can be identified as the person whose name is on the signature block of the FNSI. Mitigated EAs and FNSI, per 32 CFR 651, are signed by the Army, installation Garrison Commander and Environmental Officer certifying document review.
150	NJ Highlands Coalition	General	Although there is a standard format for EAs and it is used by the preparers, this overall presentation is not well organized, not coherent in many places, and seems disjointed. Any semblance of a clear progression of a narrative outline of the actions, events, issues, impacts, and mitigations is quickly lost. Most graphics are poor in content and illegible due to scale of reproduction or resolution. Overall, it does not communicate effectively or easily.	The EA is prepared in accordance with 32 CFR 651, *Environmental Analysis of Army Actions* .

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
151	NJ Audubon Magazine	General	A number of state and federal endangered, threatened, and rare plant and animal species occur within or in the immediate vicinity of wetlands and uplands on the proposed SAFER project. These include the plants stiff club moss, featherfoil, mountain holly, variable sedge, and other species; and the animals Bobcat, Timber Rattlesnake, Northern Copperhead, Indiana Bat, Barred Owl, Red-shouldered Hawk, Northern Goshawk, golden-winged Warbler, and other species. Other than a flat, unsupported statements of "No Impact", "Minor Impact", or "Moderate Impact" there is little to no discussion of the actual or potential effects of the project on these species; though for Indiana Bat there exists prohibition of tree-cutting past a date in early spring specified by the U.S. Fish and Wildlife Service.	In a letter dated August 13, 2012, USFWS noted, "Other than Indiana bat, no federally listed or proposed threatened or endangered flora or fauna are known to occur in the vicinity of the project site." All state-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect state-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of state-listed species (beyond that conducted to develop the INRMP) was not required. Mitigations are planned to avoid potential impacts to the Indiana bat and breeding birds, and to minimize impacts to other wildlife species that may encounter the area.
152	NJ Audubon Magazine	General	Breeding activities of Barred Owl, Northern Goshawk, and Red·-shouldered Hawk commence in late winter, within the construction time period, and could or would be affected. Not all bird breeding activity takes place in May and June.	Current plans are to fell trees during late fall or early winter. Tree felling in late winter will be avoided to the extent practicable. Additionally, the following mitigation is included in the EA and FNSI: "Felling of trees at the SAFER site will be limited to the period between 16 November and 31 March."
153	NJ Audubon Magazine	General	There is an immediate danger to local Timber Rattlesnakes and Northern Copperheads, which forage and probably hibernate in the area. No effort was made to locate a den site, and construction of the chamber and deposition of rock debris could destroy or damage this habitat.	All state-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect state-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of state-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding state-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
154	NJ Audubon Magazine	General	The impacts of heavy construction vehicles are also of concern here. Destruction or degradation of the small, isolated wetlands in the immediate vicinity-by dismissing their importance and imposing minimal buffers--will severely impact vernal pond obligate breeding species such as Wood Frog and Spotted Salamander.	A transition area waiver was applied for the SAFER site and is administratively complete. Although proposed in the transition area waiver, Picatinny will not pursue the lowering of the exceptional resource value wetland (0.04 acres in total). Picatinny will work with the NJDEP to execute the requirements specific to this permit.
155	NJ Audubon Magazine	General	Rock Stability Report. There are questions even in this report itself about the competence of the local rock to be excavated (primarily of Green Pond conglomerate and sandstone), and of the short-term and long-term viability of the proposed concrete flooring and liner to be installed in the chamber. Although the chamber itself may be safe as constructed, no mention is given of the effects of test explosions, which is the purpose of the construction.	A preliminary rock stress study has been conducted as part of the planning phase of this proposed action. Prior to excavation and construction of the chamber and adits, ARDEC will perform a rock feasibility study to confirm site stability. At this time, it is anticipated the rock feasibility study will validate the findings of the initial rock studies. The environmental effects of the feasibility studies are analyzed in the EA and applicable mitigations will be in effect. Specific engineering design details would be provided later in the design phase.
156	NJ Audubon Magazine	General	How will the materials withstand repeated blast pressure and fragment impacts? How competent is the native rock to such impacts and pressure? These questions are not answered in this report, which says such problems will be resolved should such situations occur in the future. But there are no specified contingency plans present in the reports.	A preliminary rock stress study has been conducted as part of the planning phase of this proposed action. Prior to excavation and construction of the chamber and adits, ARDEC will perform a rock feasibility study to confirm site stability. At this time, it is anticipated the rock feasibility study will validate the findings of the initial rock studies. The environmental effects of the feasibility studies are analyzed in the EA and applicable mitigations will be in effect. Specific engineering design details would be provided later in the design phase.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
157	NJ Audubon Magazine	General	The excavation of the chamber itself is located above the water table of the local aquifer, and the angle and slope of the excavation is unclear. There is no definite answer about how water seeping from fractured rock, concrete, and degraded lining will be prevented from entering the Green Pond Brook aquifer and the into the isolated wetlands present on the proposed site. Drainage and storage of the water--inevitably contaminated by the chemicals making up the explosives--is poorly described and inadequate.	The drainage and storage details, along with all details of the SAFER design, would be finalized in the design phase of the project. This degree of detail is not required for the EA. Please refer to www.cgtower.com/geoliner-manual/Geoliner%20Manual.pdf for properties of typical geoliners (not necessarily the geoliner to be selected for application at the SAFER). According to the 2012 Hydrogeologic Study, groundwater and stormwater are expected to drain into the SAFER excavation at a rate between 4 and 15 gallons per minute. A Dewatering Plan will be developed during the SAFER design phase (prior to initiating construction) to detail water management options which, as noted in Section 3.7.3 of the EA, may include a dewatering system, stormwater diversion measures, sumps, grouting, and/or other similar measures. Any water accumulating within the facility will be removed and properly handled as outlined in Section 3.11 of the EA. A monitoring Plan will be in place to ensure no adverse impact to groundwater or surface water.
158	NJ Audubon Magazine	General	Mitigation of such impacts as erosion and stream siltation, caused by rock fracturing and resultant downhill water seepage of contaminated water is mentioned but not elaborated upon.	Stream siltation would be minimized through the use of silt fencing referenced in Section 3.7.2 and elsewhere in the EA. In addition, other mitigation measures would be implemented as specified in the Erosion and Sediment Control Plan, which would be approved by the Morris County Soil Conservation District. The groundwater modeling results in Appendix B demonstrate that any residual ANFO leaching to underlying groundwater from the facility will be well within acceptable limits if groundwater is maintained at least two feet below the level of excavation and blasting. As stated in Section 3.7.3.2 of the EA, it is the construction contractor's responsibility to ensure that the dewatering plan and monitoring plan are properly implemented such that there are no significant impacts on groundwater or Green Pond Brook during SAFER construction. Mitigation measures such as concrete floor, geo-liner, and dewatering will prevent any contamination to enter the groundwater during operations.
159	NJ Audubon Magazine	General	Wetlands and Transition Area Issues. The extensive downslope wetlands of Green Pond Brook to the west of the project, and further away to the east, of Lake Denmark and Burnt Meadow Brook, are vital wetlands of Exceptional Resource Value. Not enough detail in this report is given to adequate protection of these wetlands during and after project construction. Buffering of the Green Pond Brook will require more than the stated 150-foot buffer in order to protect its wetland complex and its endangered, threatened, and rare flora and fauna. This is a narrow stream-related wetland system, and negative effects such as water pollution and siltation will be magnified and quickly apparent, probably before mitigation efforts can take place and long-term damage has occurred.	A transition area waiver was applied for the SAFER site and is administratively complete. Although proposed in the transition area waiver, Picatinny will not pursue the lowering of the exceptional resource value wetland (0.04 acres in total). Picatinny will work with the NJDEP to execute the requirements specific to this permit.
160	NJ Audubon Magazine	General	Protection of the isolated wetlands in the immediate area of the project are given a gloss and minimal buffers, even though these small wetlands are known breeding sites for Wood Frog, Spring Peeper, and Spotted Salamander.	A transition area waiver was applied for the SAFER site and is administratively complete. Although proposed in the transition area waiver, Picatinny will not pursue the lowering of the exceptional resource value wetland (0.04 acres in total). Picatinny will work with the NJDEP to execute the requirements specific to this permit.
161	NJ Audubon Magazine	General	I disagree strongly with the concluding comments in this report. Statements within the bodies of the reports themselves indicated that the findings of no significant impacts are incorrect. The reports are filled with ambiguities, unsupported findings, and hazy references to future monitoring and possible future mitigation with no supporting detailed plans. This project as it is proposed is an immediate danger to the natural environment and should not proceed.	As stated in the EA and FNSI, the impacts of the proposed action can be mitigated below significance and an EIS is not appropriate. A "mitigated EA" is acceptable and encouraged by CEQ as stated in the guidance on Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact. "The use of mitigation allows an agency to comply with NEPA's procedural requirements by issuing and EA and FNSI based on the agency's commitment to ensure the mitigation that supports the FNSI is performed, thereby avoiding the need to prepare an EIS" (CEQ January 2011 Guidance). Mitigations explicitly stated in this EA are therefore not "possible future mitigations"; rather, they are legally binding.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
162	NJ Audubon Society	General	After review of the EA it is NY Audubon's opinion that based on numerous contradictory statements contained therein in regard to the proposed construction and design of the SAFER coupled with the lack of appropriate supporting documentation/data (i.e., insufficient data collection in line with appropriate species data collection standards and methodologies) regarding rare species that the information outlined therein as it pertains to impacts to rare species and groundwater does not address, quantify or substantiate the EA's FNSI in relation to the SAFER project.	Impacts from the Proposed Action were analyzed using the best scientific data available, and supporting studies have been conducted to inform both the design of the SAFER project and the analysis contained in this document. If any additional planned studies reveal unanticipated project conditions, work would halt and additional NEPA analysis would be conducted, as stated in the document.
163	NJ Audubon Society	General	As indicated in the EA, since the plans for the construction of the SAFER facility have no yet been finalized, in some cases the EA referred to as a design that is "fluid", NJ Audubon questions how the report can sufficiently assess the potential long and short term environmental impacts to biological and natural resources (i.e., various wildlife species and ground water) on site as required under NEPA process and as stated on Page 7 (Conclusion) that indicated "the ARDEC has met the requirements of NEPA under section 102(2)(C) and therefore, may proceed with the construction and operation of the proposed SAFER. The preparation of an EIS is not required." The mere fact that the EA states that the design and construction details of the proposed SAFER have not been finalized and therefore are subject to change, clearly indicates that the recommendations and proposed mitigations contained therein cannot be substantial and thus the EA fails to properly and thoroughly address the NEPA process.	NEPA is a planning tool in which CEQ regulations encourage the early use--before all of the fine details of the Proposed Action are finalized. In fact, 40 CFR 1502.2(g) warns that NEPA should not become an after-the fact process that justifies decisions that have already been made. Therefore, NEPA analyses are rarely initiated after a project has reached final design. The footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document. Furthermore, as stated in the document, should conditions be encountered during project construction that may result in unanticipated environmental impacts, activities would be halted and supplementary NEPA analysis would be undertaken at that time.
164	NJ Audubon Society	General (Bio)	One of the most glaring issues with recommendations regarding impact to rare species as well as proposed mitigation for said species impacts is the severely lacking biological data that would normally be obtained through proper survey data collection (i.e., multiple surveys performed at appropriate times of the year to confirm locations of important life cycle areas (i.e., breeding, foraging, basking, gestation, hibernacula, etc.) for said species. For example, as stated in section 3.8.1.3 Threatened and Endangered Species and Species of Concern of the EA, "It is not currently known whether any timber rattlesnake hibernacula are present at the proposed SAFER site"... "	All state-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect state-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of state-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding state-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
165	NJ Audubon Society	General	Also Picatinny Arsenal and NJDFW are in the process of conducting surveys for timber rattlesnakes within the proposed SAFER project site, to include the proposed rock storage sites. The surveys would be conducted to consider seasonal variations in snake locations and habituation within the area. The first of the surveys was conducted in August 2011, and timber rattlesnakes were observed in the vicinity of the SAFER site." If the first of the surveys were done in August 2011 and timber rattlesnake were encountered in the survey area at the proposed SAFER site, but it is unknown if there are any timber rattlesnake hibernacula are present at the proposed SAFER site, then NJ Audubon questions how the report can sufficiently assess the potential long and short term environmental impacts to this rare species when the location of hibernacula has yet to be determined.	In consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.

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166	NJ Audubon Society	General	Based on the information contained in the EA it is apparent that the limited and/or lack of appropriate surveys for several rare species (including, but not limited to, timber rattlesnake, northern copperhead, wood turtle, bat species), that have either been documented on site and/or have potential to be on site, do not offer enough biological data to determine or assess potential impacts to these species. Therefore, NJA considers statements such as on Pg. 7 (Conclusion): "Based on review of the information contained in the EA, the respective decision makers have determined that, with the implementation of specified mitigation measures, building and operating at the SAFER would have no significant effects on human health or the natural environment, and would have no significant cumulative effects on human health or the natural environment", are unfounded since the EA findings do not appear to be based on complete and accurate information or founded in, or backed by, the framework of accepted scientific literature and field studies available for the specific species that are identified in the EA.	All state-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect state-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of state-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding state-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
167	NJ Audubon Society	General	NJA recognizes that the federal Assimilative Crimes Act exempts the military (i.e., Picatinny Arsenal) from the requirement of protecting State-listed species (such as the timber rattlesnake, wood turtle, etc.), however, Picatinny Arsenal's Integrated Natural Resource Management Plan (INRMP, 2011) and the DoD Instruction (DoDI) document (No. 4715.03, March 18, 2011) both acknowledge the need for natural resource stewardship attention in achieving the military's mission. It is NJA opinion that the information and recommendations outlined in the EA clearly demonstrates a failure to satisfactorily consider natural resource protection for rare species and to minimizing harm to these rare State species and species at risk, which are a target group specifically addressed in the DoDI document.	All state-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect state-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of state-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding state-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. It should be noted that the referenced DoDI document states the following, "DoD shall, to the best of its ability, implement conservation and management efforts to further the conservation of State-listed species when such action is practicable and does not conflict with legal authority, military mission, or operational capabilities." The SAFER project meets the mission requirements for the Picatinny Arsenal. Finally, the Assimilative Crimes Act has nothing to do with the applicability of State laws on the federal government. The federal government has not waived sovereign immunity under the federal Endangered Species Act.
168	NJ Audubon Society	General	NJA respectfully requests a public hearing to provide Picatinny Arsenal with an opportunity to elucidate and provide additional information and specifics for items that appear vague (such as references to the "use of best construction practices in order to protect listed snakes" -as listed in bullet point 2 paragraph 4 page 3-59 and 3-60) or incomplete (i.e., such as proposed mitigation measures for rare species impacts -as listed on pages 5-6, Table 2).	Public involvement was conducted in accordance with 40 CFR 1506.6, through the use of a 30-day public comment period (extended at the request of the public) to allow stakeholders and interested parties to comment on analysis in the EA and conclusions reached in the draft FNSI.

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169	NJ Audubon Society	General	NJA recommends that Picatinny Arsenal, including the Natural Resource Manager/Biologist for Picatinny Arsenal consult and/or implement recommendations provided by the NJ Division of Fish and Wildlife for performing proper species survey work, as well as strategies that may be able to minimize harm to rare species.	Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.
170	NJ Audubon Society	General	NJA recommends that given the scope of the project and the potential impacts to not only rare species but natural resources and human health that a full EIS be completed for this project in order to obtain the necessary information to sufficiently assess all environmental impacts to meet the Declaration of National Environmental Policy in Title I of NEPA which requires the federal government to use all practicable means to create and maintain conditions under which man and nature can exist in productive harmony.	As stated in the EA and FNSI, the impacts of the proposed action can be mitigated below significance and an EIS is not appropriate. A "mitigated EA" is acceptable and encouraged by CEQ as stated in the guidance on Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact. "The use of mitigation allows an agency to comply with NEPA's procedural requirements by issuing and EA and FNSI based on the agency's commitment to ensure the mitigation that supports the FNSI is performed, thereby avoiding the need to prepare an EIS" (CEQ January 2011 Guidance).
171	NJ Highlands Coalition	General	Lack of diligent efforts to promote public involvement during the development of the dEA/FNSI: Although PICA had provided a 30-day public review —and extended by an additional 7-days at our request; there is no other record of involvement of, or outreach to e members of the public or NGOs, in making a determination of public interest. On February 3, 2012, within the tolling of the public review period, I spoke with both the Township Engineering Department and Township Clerk of the adjacent municipality, Rockaway Township. They had not received any notice if the dFNSI, nor had they any knowledge of the proposed project (although the Township had received notification by PICA of the immediately preceding draft EA for the Building Demolition Project). For a project of this complexity and because of the well known public-trust resource values that are known features of the general location, CEQ and Army guidance indicate that maximum public involvement is needed to steer and support the process effectively. For a project that has apparently been under consideration and development for over three years, there is lack of proactive discussions involving the public or any effort at transparency (CEQ 1500.1 (b)).	Per 32 CFR 651.14, Integration with Army Planning, "Findings of no significant impact. (i) A proponent will make an EA and draft FNSI available to the public for review and comment for a minimum of 30 days prior to making a final decision and proceeding with an action...At the conclusion of the appropriate comment period, the decision maker may sign the FNSI and take immediate action, unless sufficient public comments are received to warrant more time for their resolution." Furthermore, Picatinny Arsenal has been working with stakeholders (USFWS, NJDEP, etc.) in the development of this analysis, and the public comment period provided, which was conducted prior to finalization of a FNSI and extended at the request of the public, meets the requirements in Section 1500.1 (b).

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
172	NJ Highlands Coalition	General	Substandard usage of available for computer technologies to disseminate information to public stakeholders widely and to maximum extent per Army rules: The only contact information in the dEA/FNSI, to request additional information or to file comments was a post office mailing address for Mr. Rowland at his PICA office. There was no telephone number listed or email address provided. It required considerable research on my part, and many telephone calls, to eventually find a valid telephone number for Mr. Rowland as PICA does not have a discernible telephone directory, either web-based or through a central office operator. This considerable research was necessary merely to ask if digital submission of comments were acceptable. I expect that only the most determined individuals would have gone the distance required to get this information. What I found particularly troubling in these daunting quests for basic information was how pervasively the door was shut on public scrutiny of the dEA/FNSI. For example, the only public access to the dEA/FNSI is by navigation to the Environmental Affairs section of the PICA website. Once there, the first time visitor using various internet browsers are greeted with this message: (problems with security certificates). The brave viewer who marshals on may eventually come to the page “NEPA DOCUMENTS AT PICATINNY ARSENAL”, where a link to the subject dEA/FNSI may be found. Here, a summary of the dEA/FNSI status is provided, which states, “…With the implementation of specified mitigation measures, the EA has resulted in a finding of no significant impact (FNSI) for the proposed action.” The emphasis above is mine; to point out that an interested member of the public could be mislead to believe that PICA has come to a final conclusion about this project. No information or reference is provided at this stage indicating the start, end, or duration of a public comment period.	The EA is prepared in accordance with 32 CFR 651, *Environmental Analysis of Army Actions* . The public notice contained a link to an electronic version of the documents and a hard copy was made available at the Rockaway Public Library. The Picatinny web page, under the tab entitled "Contact Us", has the phone number for Picatinny Public Affairs, as well as the number for the Picatinny Operator to direct your call as requested. Pursuant to security guidance issued by the Department of Defense in the wake of 9/11 we are not permitted to publicize the names and phone numbers of federal employees. Therefore we are unable to maintain a web-based telephone directory. Unlike an EA or EIS, the Finding of No Significant Impact (FNSI) is a decision document. A FNSI is a document that briefly states why an action (not otherwise excluded) will not significantly affect the environment, and, therefore, that an EIS will not be prepared. Per NEPA guidance, it is sent out for comment in the draft form (unsigned) with the intent that once it is signed, the Proposed Action will take place. Per 32 CFR 651.14, Integration with Army Planning, "At the conclusion of the appropriate comment period, the decision maker may sign the FNSI and take immediate action, unless sufficient public comments are received to warrant more time for their resolution." The release of a draft FNSI indicates that a decision has not yet been finalized, and the Notice of Availability specifies that the public comment period runs for 30 days from the date of publication (January 11, 2012).
173	NJ Highlands Coalition	General	Failure to see the gravity or importance of this unique action in its environmental context (40 CFR 1505.3 and 1501.4(e)(2)): PICA is the largest tract of public land in the New Jersey Highlands region. Two state-designated Natural Heritage Priorities Sites (NHPS) abut one another along the spine of Copperas Mountain. To the east is Lake Denmark NHPS and paralleling it to the west is Green Pond Mountain NHPS. The project proposes the construction of new roads, forest clearing, blasting, storage sites for quarried rock, deep excavations into a mountainous terrain in close proximity of groundwater tables, wetlands and stream buffers, and diverse plant communities, riparian corridors and known habitat for threatened and endangered species. WET references NJDEP Endangered and Nongame Species Program opinion that these NHP sites represent “some of the state’s best habitats for rare and endangered species and ecological communities”. Although the Lake Denmark site is noted in the EA, the Green Pond Mountain site is not—even though it encompasses all of the gorge area which will be the most affected riparian corridor during the construction and future operations phases. CEQ 1505.3 & Fed. Reg. vol. 76, No 14 (Jan. 11, 2011) points out the criteria for assessing importance, which includes protected resources, public interest, intensity (of action), human health or safety, legal requirements, permits, or regulations that maybe pertinent.	The Green Pond Mountain Natural Heritage Priority (NHP) Site is located adjacent to the Lake Denmark NHP Site and in the vicinity of the SAFER site. The January 2012 EA was prepared with the understanding that the SAFER project site and all affected areas are located within these NHP areas.
174	NJ Highlands Coalition	General	Lack of accurate and clearly presented Environmental Information (40 CFR 1506.5). Disconnected or inaccurate information are found in the Erosion and Sediment Control and Stormwater Evaluation (ESC) reference document. 25th Avenue is referred as a location on Figure 2, but is nonexistent, as is Copperas End road referred to in Figure 5; There are three different locations for 4th Avenue on the Figure 5.	The ESC report will be revised such that the reference to 25th Avenue is removed. The SAFER location is located in the Gorge Test Area on Copperas Ridge Road, which connects off of Upper Gorge Roadway. Copperas End Road is an incorrect reference. The correct name is Copperas Ridge Road.
175	NJ Highlands Coalition	General	Over-reliance on contract consultants for preparation of EA. CEQ 1506.5 holds the lead agency responsible for any information that may be prepared by delegation to others. There are no specific credentials listed that qualify the “expert” title given to the consulting EA preparers. With whom did PICA contract for the various studies listed on page 2-10 of the EA? Did any of these contractors help prepare the EA or FNSI? Will they be involved in any monitoring efforts?	Section 6.0 of the EA, List of Preparers, has been revised to include degrees and years of experience for Preparers. Additionally, the snake surveys were conducted by NJDEP-qualified biologists.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
176	NJ Highlands Coalition	General	Lack of clearly identified and assessed mitigation measures (32 CFR 651.15(b)). This is one of the most problematic aspects playing this dEA/FNSI. All mitigation measures are only vaguely described or explained. Many are yet to be determined. If they are vague or TBD, then they cannot and have not been assessed as to their efficacy in reducing significant impacts. This is a fatal flaw. Example include- ESC on Pp. 8-9: “measures (from sections 4 & 5 of this report)” have yet to be selected or even “proposed“ and are not discussed in the EA. ESC p 16: “…additional measures will ensure sediment laden water” will not enter Green Pond Brook. The additional measures are never specified. WET p 15, IX; it is indicated that minimization measures and compensatory mitigation are part of the pending permit; yet they are not mentioned in the EA tables of “proposed mitigations”. Even if they were, according to the authority the draft EA in Section 5 confers, the PICA decision maker is required only to consider the proposed mitigation, and to commit only to those decided for adoption in the signed final FNSI. Mitigation, proposed in subdocuments are overlooked in the draft EA, and even though the EA states that “mitigation measures must be adopted to mitigate potentially severe or significant environmental consequences”, actual adoption of any proposed mitigation that surfaced in the EA is entirely at the discretion of the decision maker.	The EA is prepared in accordance with 32 CFR 651, Environmental Analysis of Army Actions. Per 32 CFR 651.15(c), "Based upon the analysis and selection of mitigation measures that reduce environmental impacts until they are no longer significant, an EA may result in a FNSI. If a proponent uses mitigation measures in such a manner, the FNSI must identify these mitigating measures, and they become legally binding and must be accomplished as the project is implemented." Mitigation measures are discussed in each relevant section of the document and are summarized in Table FNSI-2 and Table 5-2.
177	NJ Highlands Coalition	General	Lack of definite mitigation commitments and/or sufficient funding (32 CFR 651.15(c)(d)). CEQ guidance and CFR 32 651.35(g) make it clear that mitigation identified must be implemented, and are binding on the agency. However, if funding is not sufficient or lacking, or manpower is not available, then mitigation is not required The d-EA/FNSI and other documents do not indicate, either qualitatively or quantitatively the costs for proposed mitigation measures, nor are the costs of the feasibility studies, permits, or construction assigned. If funding limitations constrain the ability to carry out the required mitigation, budgets must be applied across all actions. The scope of the projects must be limited in proportion to the cost of mitigation. Proposed activities may not be allowed to deplete the budgets required to mitigate. In CEQ guidance Best Management Practices (BMPs) are seen as mitigation measures especially when incorporated into project designs; however this EA indicates that “BMPs are not required”, even though they might reduce impacts. It is unclear if a permitting agency specifies a BMP as a condition of their permit, it can be by PICA as an ultimately optional measure.	The EA is prepared in accordance with 32 CFR 651, Environmental Analysis of Army Actions. Per 32 CFR 651.15(c), "Based upon the analysis and selection of mitigation measures that reduce environmental impacts until they are no longer significant, an EA may result in a FNSI. If a proponent uses mitigation measures in such a manner, the FNSI must identify these mitigating measures, and they become legally binding and must be accomplished as the project is implemented. The proponent must implement those identified mitigations, because they are commitments made as part of the Army decision. The proponent is responsible for responding to inquiries from the public or other agencies regarding the status of mitigation measures adopted in the NEPA process. The mitigation shall become a line item in the proponent's budget or other funding document, if appropriate, or included in the legal document implementing the action (for example, contracts, leases, or grants). If any of these identified mitigation measures do not occur, so that significant adverse environmental effects could reasonably expected to result, the proponent must publish an NOI and prepare an EIS." Additionally, BMPs are not required to reduce impacts below the level of significance, thereby distinguishing them from required mitigation, however if they are deemed appropriate as dictated by project conditions, they would be implemented.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
178	NJ Highlands Coalition	General	Lack of mitigation monitoring and enforcement program (or plans) to support the dFNSI (40 CFR 1505.2 (c); 32 CFR 651.15(i)(1)). 40 CFR 1505.2 (C.) Emphasizes that there must be explicit commitments to both the mitigation measures, as well as carefully detailed monitoring, quality assurance, and evaluations of the mitigation measures. The mitigation must be measurable as to the effectiveness for reducing significant impacts. The dEA/FNSI fails to incorporate monitoring plans, quality metrics, and enforcement mechanisms. A monitoring protocol depends upon the collection of baseline data before project implementation and mitigations commence. The dEA/FNSI identifies resources for which baseline data is currently lacking, with no subsequent plan to address. Monitoring is a requirement if proposed is to succeed. Without addressing the absence of baseline conditions, mitigation fails here. In fact, monitoring plans for each of the “proposed mitigations” is wholly missing in this dEA/FNSI. Mitigation monitoring is required and is to be discussed in an EA whenever there are controversial proposals, adverse impacts to Federal or state protected resources, or statutory permitting requirements. In this SAFER project, all these factors are in play, but the EA inadequately addresses how even the “proposed” mitigations will sustain the environment or prevent significant impacts The dEA/FNSI and reveal substantially inadequate documentation and it does not meet CEQ (40 CFR) or most Army (32 CFR) NEPA standards for sufficiency. It should be rescinded due to the many faulty assumptions, weak analyses, and ineffective mitigation.	Mitigation measures and BMPs are discussed in the Environmental Consequences section of each resource area. The current INRMP establishes baseline conditions at the Picatinny Arsenal which are summarized for the reader in the EA. The EA is prepared in accordance with 32 CFR 651, Environmental Analysis of Army Actions. Monitoring Plans to be developed to ensure no significant environmental impacts are discussed in the EA. Specifics of the monitoring plans will be developed in the design phase.
179	NJ Highlands Coalition	General	WET p 45, submitted one year ago, indicates that decisions are still pending regarding transition zone width, wetlands habitat value rating; and verification of delineation. How can a FNSI be supported with wetlands parameters unknown ? This is simply one example of many as yet unanswered questions or requirements.	A transition area waiver was applied for the SAFER site and is administratively complete. Although proposed in the transition area waiver, Picatinny will not pursue the lowering of the exceptional resource value wetland (0.04 acres in total). Picatinny will work with the NJDEP to execute the requirements specific to this permit.
180	NJ Highlands Coalition	General	In January 2009 a proposal (option 2) was presented for a chamber dug into side of a mountain with a flat steel roof, then earth covered, with hanging blast doors on the front side. This would not be dug downward, nor deeply; it would essentially be a rock shelter with steel blast doors closing the open side. This cost half as much as the underground option (SAFER); and could be built in the same location. This option 2 met all the same criteria as the underground one. Why was it rejected?	The Fragment Containment Test Stand (FCTS) was considered in the alternatives analysis but was not carried forward for analysis because it did not meet the size and sustainability requirements of the SAFER. As stated in the EA, "This facility does not meet the criterion for test chamber size or long-term sustainability. ARDEC requires a facility that could be fully utilized into the foreseeable future while the operations and maintenance of the facility remains steady. The stand-alone, fragment-controlled facility would potentially continue to degrade over time and is projected to require regular costly maintenance of the specialized interior steel reinforced concrete walls." Please refer to Section 2.3.2.4 and Table 2-1 for additional information.
181	NJ Highlands Coalition	General	From the EA there are: groundwater monitoring plan, surface water quality, rock storage ANFO mitigation, safety plan, wetland (transition area), dewatering, and environmental affairs SAFER project monitoring plan. From the ESC there are: ESC plan, storm water pollution prevention plan, and groundwater protection program plan. Since nearly all these plans are yet to be determined, how and where are any BMPS or mitigation measures within these plans identified. These several plans must be the developed and coordinated with multiple agencies or PICA organizations and listed in this EA to sustain a FNSI. The dEA/FNSI fails to plan for any monitoring and enforcement.	The specific design for the roadway has not been finalized, nor has it been determined that the roadway would be paved. The specific design for the rock storage piles has also not been finalized and is pending further site characterization. The ESC report focuses on the roadway and rock storage areas. Specific measures would be incorporated into the designs and included in permit applications. These plans would be developed as part of the project timeline prior to implementation of the activities they are intended evaluate and monitor, and would be done so in cooperation with required stakeholders. These plans would provide the framework for monitoring and enforcement.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
182	NJ Highlands Coalition	General	Identified permits within the EA and other references are: storm water general, discharge to groundwater, wetland transition area waiver(for SAFER site), another transition area waiver (for Gorge road), flood hazard control in riparian area. Permits as yet unspecified are likely to be needed for; stream encroachment, stabilized construction entrance, and sediment basins. The documents do not indicate if any of these are issued or even applied for, except for one wetlands transition area waiver. Have any of these other permit applications been submitted and have any been issued? Who within PICA is responsible for assuring they are received and followed, especially if granted to a contractor?	A transition area waiver was applied for the SAFER site and is administratively complete. Other listed permits would be applied for once design development is complete. Erosion and sediment control and stormwater management measures would be included in those designs.
183	NJ Highlands Coalition	General	Contractors are identified yet presumably many are sub-contractors to a primary contractor. If so, this should be made clear in the text. These are the contractors mentioned: construction, dewatering, mining, blasting, certified ANFO transporter, certified geologist and hydrologist. Responsibilities for developing mitigation measures, obtaining state permits, or developing plans is alternating between the construction and dewatering contractors. Have any of these contracts been awarded? Have any of the contractors helped prepare this EA? Is the construction and dewatering contractor one and the same? Is the mining and blasting contractor one and the same?	The EA and NEPA Process are separate from the referenced plans. The use of contractors is common practice and enables the installation to acquire objective, specialized subject matter expertise, and is in accordance with 32 CFR 651, *Environmental Analysis of Army Actions* . All contractors who have helped prepare the EA are identified in Section 7.0.
184	NJ Highlands Coalition	General	If the presentation of the disparate and mostly hidden references to the multiplicity of required plans and permits is any indication, then the implementation, and monitoring and enforcement is likely to be even more deficient or absent. The lack of coordination suggests dysfunction will occur on many fronts and at many levels. This does not reassure public confidence in the protection of the environment.	The Proposed Action was analyzed using the best scientific data available and in accordance with current regulations. A variety of supplementary surveys and information-gathering mechanisms have been undertaken or committed to in order to ensure that impacts to the human health and environment have been considered.
185	NJDEP	General	Although the federal Assimilative Crimes Act exempts the military (i.e., Picatinny Arsenal (PICA)) from the requirement of protecting State-listed species, Picatinny Arsenal's Integrated Natural Resource Management Plan (INRMP, 2001) and the DoD Instruction (No. 4715.03, March 18, 2011) both discuss the consideration of natural resource stewardship in achieving the military's mission. The EA does not adequately consider natural resource protection as few strategies, are dedicated to minimizing harm to rare State species and species at risk, a target group specifically address in the DoDI document.	All state-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect state-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of state-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding state-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. It should be noted that the referenced DoDI document states the following, "DoD shall, to the best of its ability, implement conservation and management efforts to further the conservation of State-listed species when such action is practicable and does not conflict with legal authority, military mission, or operational capabilities." The SAFER project meets the mission requirements for the Picatinny Arsenal. Finally, the Assimilative Crimes Act has nothing to do with the applicability of State laws on the federal government. The federal government has not waived sovereign immunity under the federal Endangered Species Act.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
186	NJDEP	General	The ENSP cannot support any of the statement made throughout the EA that indicate that there will be no impacts or minor impacts to species at risk (e.g., Timber Rattlesnakes and Wood Turtles), and State species of Special Concern, Northern Copperheads and Eastern Box Turtles. This position is based on the lack of complete biological data and their species expertise and experience. Without this information, the project impacts to these species during construction and operation can not be fully determined or mitigated.	All state-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect state-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of state-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, In consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. Based on the new information and analysis, Picatinny Arsenal maintains that, with the implementation of the proposed mitigations, impacts to listed snakes will be minor to moderate. Also, note that many of the mitigations being adopted to protect listed snakes will also aid in the protection of other listed species such as turtles.
187	NJDEP	General	NJDEP also cannot support the statements in the EA that "impacts will be moderate with proposed mitigation." Many of the proposed mitigation measures that are indicated in the EA to minimize or avoid impacts to threatened and endangered species are unfounded without biological data and complete details of the proposed mitigation measures.	All state-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect state-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain state-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of state-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, In consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA. Based on the new information and analysis, Picatinny Arsenal maintains that, with the implementation of the proposed mitigations, impacts to listed snakes will be minor to moderate. Also, note that many of the mitigations being adopted to protect listed snakes will also aid in the protection of other listed species such as turtles.
188	NJDEP	General	This EA does not provide adequate conservation measures to protect NJ's rare snakes. It is important to recognize that PICA has a unique opportunity to support the long-term survival of NJ's rare snakes in this area given the inability for collectors and hobbyists to enter the facility and negatively impact the local snake populations. In addition, given the infrastructure surrounding PICA and adjacent State and private lands (i.e., Berkshire Valley Rd. and Rts. 15, 23, 80, and 513), the local snake populations are confined to this forested area, which includes PICA, and therefore, it is imperative that local populations are protected (to the best extent possible) in order to ensure continued genetic exchange and subsequent, long-term survival. PICA's INRMP (2001) frequently addresses the importance of maintaining "dispersal habitat corridors" and habitat connectivity. While this project does not appear to cause sever habitat fragmentation, when dealing with (and attempting to minimize harm to) reptiles and amphibians, i.e., species with fidelity to dispersal/travel corridors and summer ranges, any alteration of these corridors and local habitats could be detrimental.	All State-listed species are discussed in the State-approved INRMP. The need for management guidelines to protect State-listed species was assessed during the development of the INRMP. The management guidelines adopted in the INRMP state that Picatinny Arsenal will passively maintain State-listed target species and associated habitats and that specific surveys prior to ground disturbing activities are not required. The INRMP lists additional species-specific recommendations, but indicates that these recommendations are "contingent upon available resources or supplemental funding". Thus, further assessment of State-listed species (beyond that conducted to develop the INRMP) was not required. Nonetheless, in consideration of stakeholder comments regarding State-listed snakes, Picatinny Arsenal completed all NJDEP-recommended snake surveys during April through August 2012. Results of both the 2011 NJDEP surveys and the 2012 surveys conducted by NJDEP ENSP-approved contractors, as well as mitigations developed based on those results, have been incorporated into the EA.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
189	USFWS NJFO	General	Once the SAFER is operational, noise levels would be lower than those during construction. Munitions detonations would occur within a chamber. The chamber would have concrete floors to reduce impacts from munitions, a geo-liner to trap contaminants, a vertical ventilation stack and double doors that would prevent fragmented material from exiting the facility and prevent wildlife from entering the facility. The EA does not provide a thorough review on how noise, during munitions testing, would impact the Indiana bat. USFWS requests the Army to provide an estimated noise exposure level from munitions testing. However, considering munitions will be tested within a closed blasting chamber, USFWS concurs operational blasting is not likely to adversely affect the Indiana bat.	EA Sections 3.4 and 3.9.2.3 have been revised to include additional information regarding potential noise impacts to Indiana bats. USFWS reviewed the revised text and, in a letter dated August 13, 2012, concurred that SAFER construction and operations activities may affect, but are not likely to adversely affect, the Indiana bat.
190	USFWS NJFO	General	Vibrations would occur during the construction and operation of the SAFER. While in construction, vibration waves would occur when explosive charges detonate rock. In operation, vibration waves would occur during munitions testing. The size of the vibration waves vary based on the amount of explosives used and rock properties. USFWS believes vibrations caused by construction blasting may affect summering and pre-hibernating Indian bats, therefore construction blasting should not occur when Indiana bats are likely to be present (April 1-Nov 15).	EA Sections 3.4 and 3.9.2.3 have been revised to include additional information regarding potential vibration impacts to Indiana bats. USFWS reviewed the revised text and, in a letter dated August 13, 2012, concurred that SAFER construction and operations activities may affect, but are not likely to adversely affect, the Indiana bat.
191	USFWS NJFO	General	Environmental resource values must be considered for this project. The proposed SAFER location is in close proximity to wetlands that are considered an exceptional resource value. The draft EA concludes that mortality of Indiana bats is anticipated from project construction or implementation. At this point USFWS believes impacts from the construction and operations of the project to the Indiana bat may be significant and do not support the lowering of the resource value. The New Jersey Department of Environmental Protection must also coordinate with USFWS on any proposed resource value changes.	Although proposed in the transition area waiver, Picatinny would not pursue the lowering of the exceptional resource value wetland (0.04 acres in total). Impacts to 0.04 acres of wetland transition area would not likely result in an appreciable reduction to the distribution of the species given the availability of the remaining suitable habitat in the surrounding landscape and the availability of the nearby potential hibernacula. The wetland itself would not be impacted and conservation measures are in place to minimize the impact of sedimentation and runoff on wetlands and streams to avoid and minimize any water quality impacts outside the Proposed Action area and minimize impacts to the aquatic insect prey base for the Indiana bats. Additionally, the draft EA did not anticipate mortality of Indiana bat, but rather discussed how mortality would be avoided (e.g., by limiting tree clearing to the period between 16 November and 31 March). See response to Comment 193 below.
192	USFWS NJFO	General	The description of the SAFER chamber doors in the draft EA is not sufficient to determine if Indiana bats could use the chamber for roosting. Indiana bats are known to day roost in caves, bridges and bat houses. The draft EA needs to provide a more thorough description of the chamber doors and how they prevent wildlife from entering the facility. If the chamber doors have gaps or open spaces, bats would be able to enter and roost within the testing facility and be susceptible to noise and vibration impacts during munitions testing.	A more detailed description of the SAFER doors has been included in EA Section 3.9.2.3. The doors will preclude any insects, bats and other wildlife from infiltrating the SAFER chamber. USFWS reviewed the revised text related to chamber doors and, in a letter dated August 13, 2012, concurred that SAFER construction and operations activities may affect, but are not likely to adversely affect, the Indiana bat.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
193	USFWS NJFO	General	The draft EA states that "minor" impacts will occur through incidental mortality, destruction of roosting and foraging habitat, increased noise and disturbance, air quality impairments, and water quality impairment that could decrease invertebrate populations. USFWS cannon concur that impacts are "minor" when they rise to a level where incidental mortality of Indiana bats is anticipated to occur. Therefore, USFWS cannot concur with the Army's draft FONSI determination. USFWS recommends that the draft EA be revised to address the concerns identified.	As discussed in the January 2012 EA (page 3-57), incidental mortality of Indiana bats would be avoided by restricting tree felling to times when Indiana bats are hibernating (i.e., tree felling may occur only during November 15 through March 31). No incidental mortality of bats is expected to result from this project. We believe that poor wording of the introductory paragraph of the Indiana bat discussion (i.e., first complete paragraph on page 3-57) may have caused confusion on this issue. This paragraph has been revised as follows: "The construction of the SAFER would cause increased noise and vibration, as well as very limited habitat loss. These impacts may affect, but are not likely to adversely affect, the Indiana bat. This section evaluates how the following potential impacts would be avoided: direct impacts to roosting bats, loss of roosting and foraging habitat, increased noise and vibration, air quality impairments, and water quality impairments that could decrease invertebrate prey populations. The implementation of BMPs and conservation measures are expected to eliminate or reduce potential impacts of these factors." In a letter dated August 13, 2012, concurred that SAFER construction and operations activities may affect, but are not likely to adversely affect, the Indiana bat.
194	NJ Highlands Coalition	General	. Please provide the following: * CPI 2009a, as cited, Pp. 2-11; * CPI 2009b, Pp. 3-8; * Shaw 2003, Pp. 3-26; * Booz Allen 2011, Pp. 3-40; * RBA 2011, Pp. 3-42; * CPI Letter 11/2/10, p 25 Appendix B; * CPI Proposed construction timeline, 11/4/10, p 33, Appendix B; * CPI 2010 Rock Stability Report, p 34, Appendix B; * RBA 2009 Wetland Delineation, p 51, Appendix B; * Shaw Environmental & Infrastructure 2003a, p 51, Appendix B; * Shaw Environmental & Infrastructure 2003b, p 51, Appendix B;	Requested documentation was provided to commenter.
195	NJ Highlands Coalition	Enclosed Explosive Test Chamber (REF: CPI, 2009a)	Are both tunnels access entries? P 4, Sec 2.2	The EETC was prepared for the planning phase of this proposed action in January 2009. Specific engineering design details would be finalized in the design phase. The feasibility studies would inform specific engineering design and maintenance requirements of the facility.
196	NJ Highlands Coalition	Enclosed Explosive Test Chamber (REF: CPI, 2009a)	If the left tunnel is at the top of the ceiling which is 50 feet high, how is this an "alternate exit for safety concerns"? P 5, Sec 2.6	The EETC was prepared for the planning phase of this proposed action in January 2009. Specific engineering design details would be finalized in the design phase. The feasibility studies would inform specific engineering design and maintenance requirements of the facility.
197	NJ Highlands Coalition	Enclosed Explosive Test Chamber (REF: CPI, 2009a)	Will this project attempt to "compress the (task) schedule" by working "24/7" (i.e. day and night around the clock every day)? Pp. 8-9, Sec 6.1	No, construction activities would occur during normal business hours.
198	NJ Highlands Coalition	Enclosed Explosive Test Chamber (REF: CPI, 2009a)	The last sentence is very confusing! You must build the entire chamber and tunnels to determine if the "rock response" will be sufficient for "bolting, strapping, and steel erection" P 9, Sec 6.2.3	The EETC was prepared for the planning phase of this proposed action in January 2009. Specific engineering design details would be finalized in the design phase. The feasibility studies would inform specific engineering design and maintenance requirements of the facility.
199	NJ Highlands Coalition	Enclosed Explosive Test Chamber (REF: CPI, 2009a)	Based on the previous statement in Section 6.2.3, how is it determined that "construction of the underground chamber APPEARS to be feasible"- when all the details or rock responses cannot be known until it is built? This does not make sense. P 10, Sec 7.1	The EETC was prepared for the planning phase of this proposed action in January 2009. Specific engineering design details would be finalized in the design phase. The feasibility studies would inform specific engineering design and maintenance requirements of the facility.
200	NJ Highlands Coalition	Proposed SAFER Construction Timeline (CPI, 2009)	Rock stress feasibility (testing) study inside finished chamber is not depicted or scheduled on this timeline - why? Testing the roof stability is mentioned in another CPI document.	A preliminary rock stress study has been conducted as part of the planning phase of this proposed action. Prior to excavation and construction of the chamber and adits, ARDEC will perform a rock feasibility study to confirm site stability.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
201	NJ Highlands Coalition	Proposed SAFER Construction Timeline (CPI, 2009)	Why in month 6 will a "control building be installed" when on page 3-69 in the EA it states there is an "existing control building outside the immediate area"?	Clarification: It is currently planned that the SAFER unit would be operated remotely, and munitions would be detonated from a control building outside the immediate area.
202	NJ Highlands Coalition	Proposed SAFER Construction Timeline (CPI, 2009)	This letter implies that 7 acres of trees may be bulldozed rather than cut down. Is this true?	Grubbing would be minimized to the extent possible; current plans are to fell trees by chainsaw.
203	NJ Highlands Coalition	Proposed SAFER Construction Timeline (CPI, 2009)	Why is there no mention of hauling on this chart– is it done during the drilling and blasting activity?	The construction schedule was prepared for the planning phase of this proposed action. Specific engineering and construction details would be provided later in the design phase.
204	NJ Highlands Coalition	Rock Stability Report (REF: CPI, 2010)	If 50 feet, or is it 35 feet of rock, is necessary above the chamber, why is there only 30 feet according to the EA? P 5, Sec 3.2A	The RSR was prepared for the planning phase of this proposed action in November 2010. As discussed in Section 2.3.3, the chamber would be approximately 100 feet in diameter and 50 feet high.
205	NJ Highlands Coalition	Rock Stability Report (REF: CPI, 2010)	If access tunnels, especially the one to floor of chamber, should be no more than a 10% grade, why are the drawings depicting a 16% grade (26'/160' Fig 7 cross-section A)?	The RSR was prepared for the planning phase of this proposed action in November 2010. Specific engineering design details would be finalized in the design phase. The feasibility studies would inform specific engineering design and maintenance requirements of the facility.
206	NJ Highlands Coalition	Rock Stability Report (REF: CPI, 2010)	P 5, Sec 3.2B- are these the right set of drawings, or are there different ones (not provided) in the EECT report? These are fairly legible, why aren't they in the EA, unless they are not the right set?	The RSR was prepared for the planning phase of this proposed action in November 2010. Specific engineering design details would be finalized in the design phase. The feasibility studies would inform specific engineering design and maintenance requirements of the facility.
207	NJ Highlands Coalition	Rock Stability Report (REF: CPI, 2010)	This walled in road-ramp will collect runoff from two steeply sided ridges. What is the capacity of the sump that is depicted? P 5, Sec 3.3	The RSR was prepared for the planning phase of this proposed action in November 2010. Specific engineering design details would be finalized in the design phase. The feasibility studies would inform specific engineering design and maintenance requirements of the facility.
208	NJ Highlands Coalition	Rock Stability Report (REF: CPI, 2010)	Did any PICA (or federal government) Certified Professional Geologist, or P.E. scrutinize these data supplied by a contractor for quality assurance or accuracy? If so, do they work in Picatinny or other federal agency, like Corps Engineers? APP B, D, & E	The NJDEP, Division of Water Supply and Geoscience, assisted Picatinny with the selection of the SAFER site using best available geological data and site inspection. The RSR was prepared to determine the strength and integrity of the rock for the SAFER based on site-specific geological data. The rock feasibility study would validate the findings of the initial rock studies and would be conducted prior to construction.
209	NJ Highlands Coalition	Transition Area Wavier (REF: RBA, 2011)	Why was this (1200 area) site chosen for its "accessibility", when it was rejected in 2010 for its difficult accessibility (for siting the FCTS)? (see Table 2 for FCTS EA) (also EA Pp. 2,3) "The facility location must be accessible year-round to personnel in…" P 13, IV & V	The selection of the SAFER site was based on available geological data and site inspection. The RSR was prepared for the planning phase of this proposed action to determine the strength and integrity of the rock for the SAFER site.
210	NJ Highlands Coalition	Transition Area Wavier (REF: RBA, 2011)	Why wasn't "containment of fragments" a "very pertinent safety concern" for past several decades? P 13, IV & V	Public safety, including containment of fragments, has always been a top priority of the Army.
211	NJ Highlands Coalition	Transition Area Wavier (REF: RBA, 2011)	Minimization measures: A final amendment to the plan to further reduce wetland impacts "utilizing a generator as power supply for this facility" will "prevent the need to install an electric utility line through additional transition area". The EA indicates that an electric line will be installed the remaining length of Upper Gorge Rd and up to SAFER site – explain this contradictory information? P 15, VIII Does NJDEP wetland Permit staff know that there seems to be a change?	A transition area waiver was applied for the SAFER site and is administratively complete. The final design of the roadway paving has not been developed, nor has it been finalized that paving would be performed. Utilities would be installed if the road is paved and any necessary permit modifications will be made if the road is paved. Paving operations would be limited to the existing roadway.

No.	Source of Comment	January 2012 SAFER EA Page # / Reference	Comment	Response
212	NJ Highlands Coalition	Transition Area Wavier (REF: RBA, 2011)	How many transition zones (of wetlands A, B, C, D, E, and the small CP) might be impacted if an electric line is installed? P 15, VIII	Specific engineering design details would be provided later in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document.
213	NJ Highlands Coalition	Transition Area Wavier (REF: RBA, 2011)	If minimization measures and compensatory mitigation are part of this pending permit, why aren't they mentioned in the EA Tables of "proposed mitigations"? P 15, IX	A transition area waiver was applied for the SAFER site and is administratively complete. This waiver application completed compensatory mitigation. Picatinny will work with the NJDEP to execute the requirements specific to this permit.
214	NJ Highlands Coalition	Transition Area Wavier (REF: RBA, 2011)	Why isn't the 1.05 acres cleared and converted to gravel or exposed rock near the SAFER entrance mentioned in the EA? P 91, I	Specific engineering design details would be provided later in the design phase, however the footprint of disturbance analyzed in the EA represents a "worst-case scenario." Any design options remaining would either leave the area of disturbance unchanged or reduced in size, therefore impacts from the project would be the same or less than those analyzed in the document.
215	NJ Highlands Coalition	Transition Area Wavier (REF: RBA, 2011)	In the WET the focus of this massive document seems to be on a 0.04 acre wetland and an unnamed tributary. There is no indication these water features are not very close to the SAFER entrance area. No effort is made to prevent trucks or machines from traveling over or parking on this small wetland.	A transition area waiver was applied for the SAFER site and is administratively complete. Although proposed in the transition area waiver, Picatinny will not pursue the lowering of the exceptional resource value wetland (0.04 acres in total). Picatinny will work with the NJDEP to execute the requirements specific to this permit.
216	NJ Highlands Coalition	Erosion & Sediment Control & Stormwater Evaluation (REF: Booz Allen, 2011)	What other "wetland areas will be affected by this project" that are not "delineated in Fig 6 and in the pending DEP Transition Area Waiver"? P 6, Fig6	All affected wetlands identified in the Transition Area Waiver have been analyzed in the EA.
217	NJ Highlands Coalition	Erosion & Sediment Control & Stormwater Evaluation (REF: Booz Allen, 2011)	When is ground disturbance anticipated for this project? P 10, Sec 3.1	The timeline for ground disturbance activities cannot be planned until the NEPA analysis is completed.
218	NJ Highlands Coalition	Erosion & Sediment Control & Stormwater Evaluation (REF: Booz Allen, 2011)	Who is the "wildlife biologist or herpetologist" who will decide how these special silt fences or passageways will be configured on site? P 14, Sec 4.1	The Army, Installation, and NJDEP ENSP-approved personnel would review the silt fence configuration prior to submitting ESC permit application.
219	NJ Highlands Coalition	Erosion & Sediment Control & Stormwater Evaluation (REF: Booz Allen, 2011)	Will ANFO come down on the truck tires also before being rinsed or abraded of at the SCE next to GPBrook? P 16, Sec 4.3	If rinsing is performed, due to the high solubility of ammonia in water it is likely that virtually all ANFO would come off the tires with the rinse water.
220	NJ Highlands Coalition	Erosion & Sediment Control & Stormwater Evaluation (REF: Booz Allen, 2011)	What do not disturb areas have been identified, and by whom? Are they signed or flagged off? P 28, Sec 6.1	The ESC report focuses on the roadway and rock storage areas. Those specific designs have not been developed. The limits of construction and the roadways leading to these sites would be the primary areas where traffic may enter.